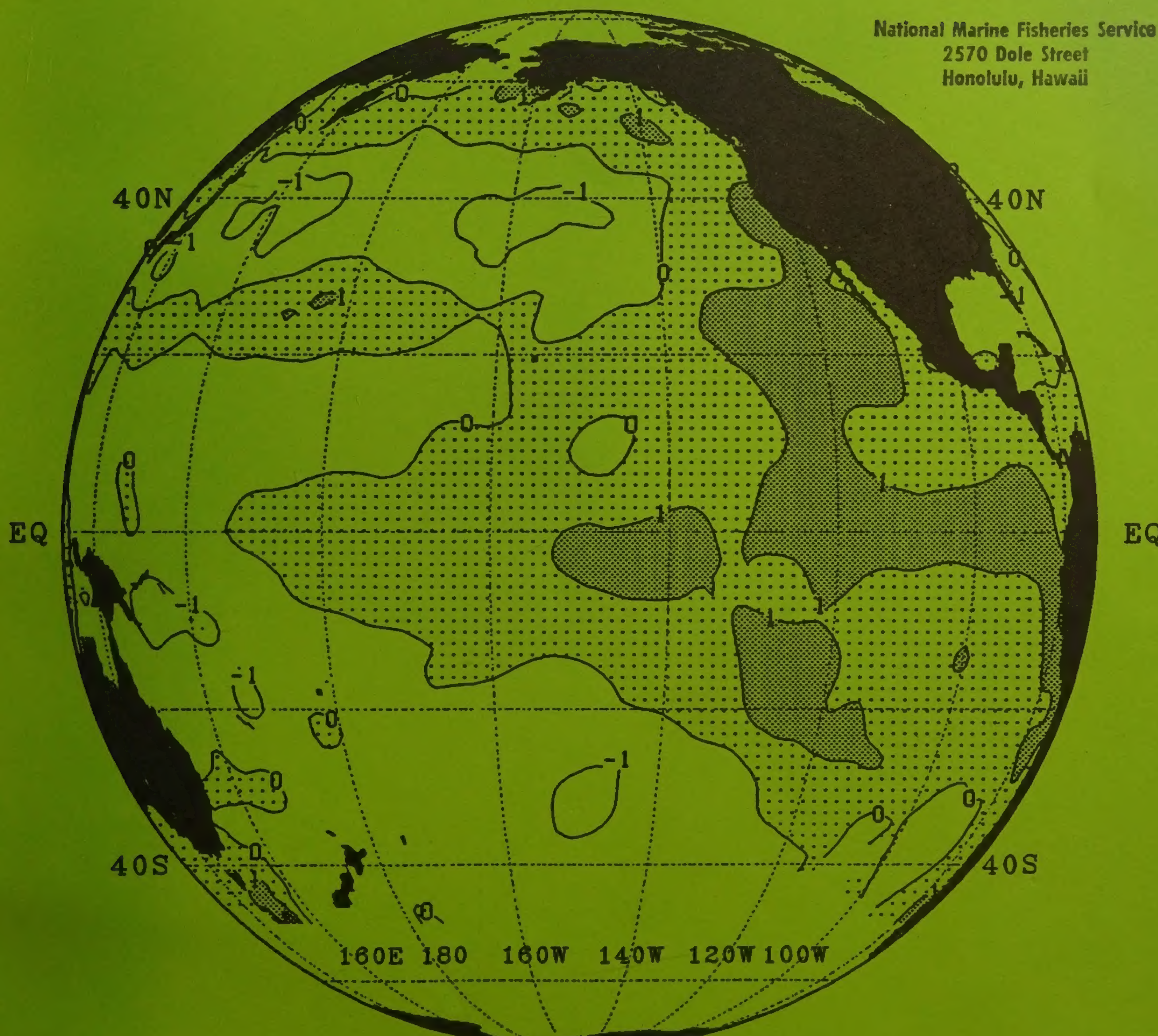
気　象　庁　海　洋　月　報

Monthly Ocean Report

May 1993　(No.5)



El Niño Monitoring Center
Japan Meteorological Agency
気象庁海洋気象部海洋課
エルニーニョ監視センター

平成5年5月

気象庁海洋月報は、気象庁海洋気象部海洋課エルニーニョ監視センターで
作成されています。本月報に関する問い合わせは、
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Monthly Ocean Report is prepared by the El Niño Monitoring Center (ENMOC), Oceanographical Division, Marine Department, Japan Meteorological Agency.

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表紙は1993年５月の太平洋の月平均海面水温偏差図です。
陰影部は平年より高温の海域を示しています。

The figure on the front cover shows the monthly mean SST anomalies for May 1993 in the Pacific Ocean. Areas of positive anomalies are shaded.

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海況の特徴（1993年5月）

太平洋の海況

太平洋赤道域の海面水温は、日付変更線以東で平年より0.5℃以上高い状態が続き、150°W以東では1℃以上平年より高く、ペルー沖では2℃以上高かった。エルニーニョ監視海域（4°S-4°N,150°W-90°W）の海面水温の偏差は、+1.4℃と昨年夏以降では最も大きくなった。西部では、負偏差が続いている（第1表、第1図、第6図）。

第9図によれば、赤道域の20℃の深度は1992年末以来、西部で150m前後の状態が続いているが、中部では少しずつ浅くなって本年5月には140m程度となり、東部ではわずかではあるが深まる傾向が続き60m程度となっている。

北太平洋の海面水温は、北米沖で1℃以上の正偏差域が広がり、カリフォルニア半島沖では一部2℃以上高かった。一方、160°W以西の5〜20°N及び日本の東方から140°Wにかけての30〜50°Nで平年より低かった(第1図)。

本年5月から6月にかけて、気象庁の海洋気象観測船「啓風丸」は日本近海から赤道域に至る東経137°Eに沿う海洋観測を行った。その結果、5〜10°Nにかけての28℃以上の暖水層の厚さは、過去5年間における同時期の観測の中で最も薄かった。また、5〜6°N付近を中心に水温躍層の南北の勾配が顕著で、東向きの北赤道反流が強いことを示唆している（図 A）。

日本近海の海況

日本近海の海面水温は、本州東方から南方にかけて平年より1℃以上低かった。一方、日本海北部及び南西諸島東方では1℃以上高かった（第17図）。

黒潮は九州・四国に接岸して流れた後、紀伊半島の東から4月に引続き大蛇行流路をとり、東海沖で32°N付近まで南下し、140°E線に沿って北上し、房総半島沖を東に流れていた（第20図）。

本州東方の親潮系の冷水（深さ100mで5℃以下）は4月よりさらに南下し、沿岸よりの分枝は犬吠埼沖の35.7°N・141.6°Eまで、沖合の分枝は37.5°N・146.7°Eまでそれぞれ達していた（第19図）。

熱帯の気象

今月も対流活動、東西循環ともエルニーニョ現象発生時に見られる特徴を示した。すなわち、対流活動は日付変更線付近で平年より活発だった。また、赤道太平洋域の東西風は上層(200hPa）で東風偏差、下層（850hPa）で西風偏差となった。また、SOIも-0.8と負偏差の状態が続き、東西循環は平年より弱かったと考えられる。季節内変動は見られたが、東進は明瞭でなかった（第1表、第12図、第13図）。［気象庁長期予報課提供］

HIGHLIGHTS May 1993

Pacific

Sea surface temperatures (SSTs) in the equatorial Pacific continued to be more than 0.5°C above normal east of the date line. SSTs east of 150°W were more than 1°C above normal and SSTs off Peru were 2°C above normal. The SST index for region B (refer to Fig.6) was +1.4°C which was the greatest value since last summer (Table 1 and Figs.1,6).

Since the end of 1992, the depth of 20°C isotherm along the equator (refer to Fig.9) was about 150m in the western equatorial Pacific. It continued to slightly shoal (deepen) in the central (eastern) equatorial Pacific this year and reached 140m (60m) in May 1993.

In the North Pacific Ocean, SSTs off North America were more than 1°C above normal and SSTs off Baja California were 2°C above normal. Negative SST anomalies prevailed from 5°N to 20°N west of 160°W, and between 30°N and 50°N from east of Japan to 140°W (Fig.1).

According to the oceanographic observations by R/V Keifu Maru of the JMA from 34°N to 3°N along the meridian of 137°E, the thickness of surface warm water (warmer than 28°C) from 5°N through 10°N was thinnest among the observations in the same period of the past 5 years. The thermocline declined intensely southward from 6°N to 5°N. This suggests that the North Equatorial Countercurrent was strong there (Fig. A).

Seas adjacent to Japan

SSTs were more than 1°C below normal east and south of Japan. On the other hand, SSTs were more than 1°C above normal in the northern part of the Japan Sea and east of the Nansei Islands (Fig.17).

The Kuroshio flew along the coast of Kyushu and Shikoku, and continued to take the large-meander path off Tokai. It flowed southward to 32°N, northward along 140°E and eastward off the Boso Peninsula (Fig.20).

Coastal and off coastal branches of the Oyashio cold water (colder than 5°C at a depth of 100m) extended southward to 35.7°N, 141.6°E and 37.5°N, 146.7°E, respectively (Fig.19).

Atmospheric conditions in the tropics

The pattern of enhanced convection over the central equatorial Pacific, along with weaker than normal convection over the western tropical Pacific has persisted. The SOI remained negative value (-0.8). The low-level (850hPa) easterlies and the upper-level (200hPa) westerlies over the equatorial Pacific also continued to be weaker than normal (Table 1 and Fig.12).
[prepared by the Long-range Forecast Division, JMA]

Depth-Latitude Section of Temperature along 137°E

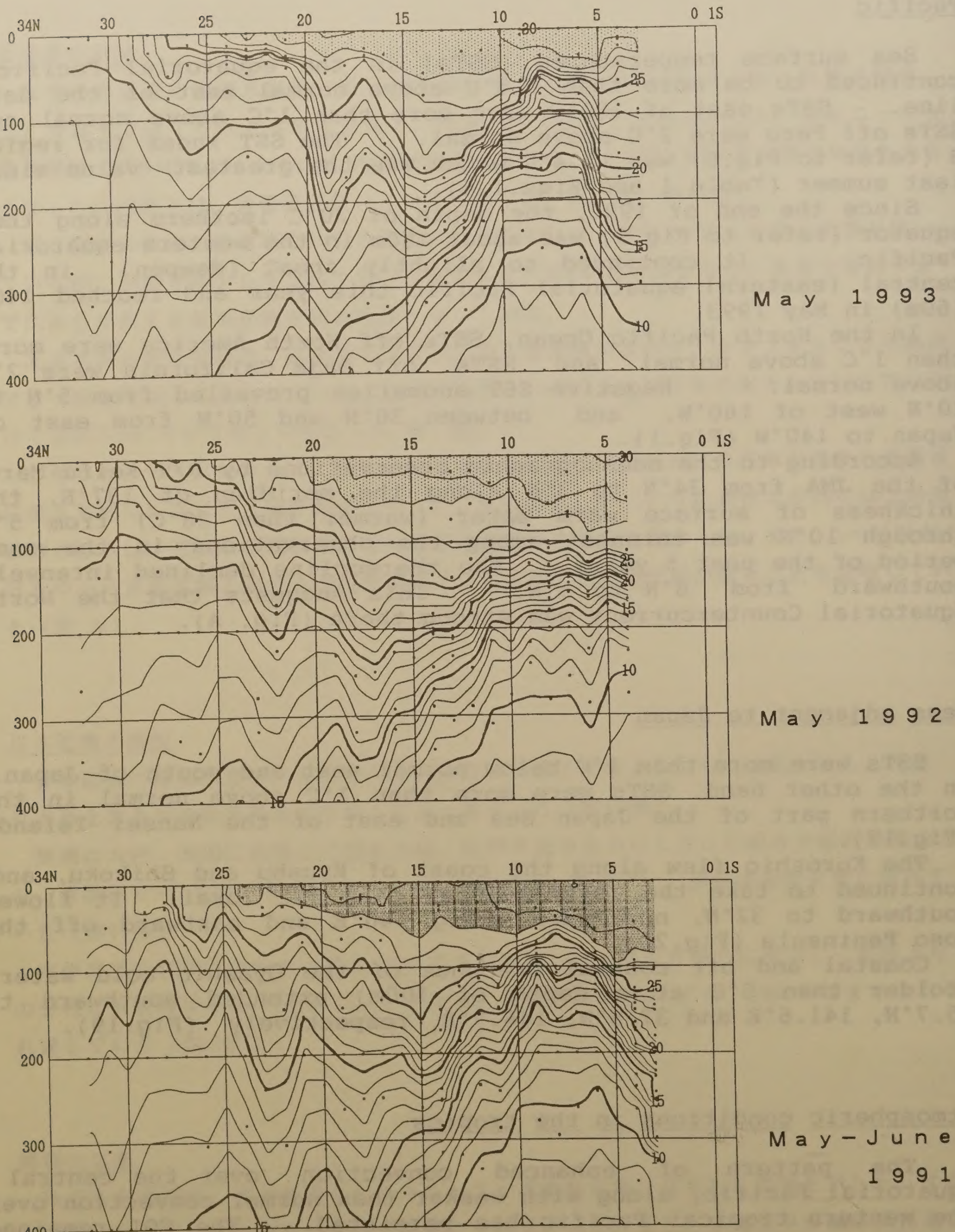


図 A　137°Eに沿う表層水温断面図（上：1993年5月、中：1992年5月、下：1991年5～6月）

Fig.A　Depth-latitude section of ocean temperature along 137°E for May 1993(top), May 1992(middle) and May-June 1991(bottom). The contour interval is 1℃.

Date		1991 DEC	1992 JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	1993 JAN	FEB	MAR	APR	MAY
Pacific Sea Surface Temperature (℃)																			
D	(14N~ Eq.)	28.6	28.1	28.0	27.9	28.7	29.1	29.4	29.1	29.1	29.2	29.5	29.0	28.7	28.0	28.0	28.2	28.6	28.8
	(130E~150E)	-0.3	-0.4	-0.3	-0.5	-0.1	0.0	+0.1	-0.1	0.0	0.0	+0.2	-0.2	-0.2	-0.5	-0.3	-0.2	-0.2	-0.3
A	(4N~ 4S)	29.4	28.9	29.0	28.9	29.2	29.4	29.2	29.2	29.1	28.8	28.8	28.7	28.8	28.5	28.4	28.4	28.7	29.0
	(160E~150W)	+1.2	+0.9	+1.0	+0.8	+1.0	+0.9	+0.7	+0.7	+0.7	+0.5	+0.4	+0.3	+0.6	+0.5	+0.4	+0.3	+0.5	+0.5
B	(4N~ 4S)	26.1	26.8	27.6	28.0	28.5	28.3	26.9	25.6	24.6	24.5	24.6	24.7	25.0	25.5	26.6	27.4	28.1	28.0
	(150W~ 90W)	+1.2	+1.4	+1.4	+1.1	+1.4	+1.7	+0.8	+0.4	0.0	-0.1	0.0	+0.1	+0.1	+0.1	+0.4	+0.5	+1.0	+1.4
C	(Eq.~ 10S)	23.2	25.1	26.8	27.5	28.0	26.4	23.7	21.6	20.5	20.2	20.8	21.2	22.5	24.3	26.1	27.0	26.4	25.2
	(90W~ 80W)	+0.6	+0.8	+1.1	+1.6	+2.9	+2.5	+1.0	0.0	-0.1	-0.1	+0.1	-0.3	-0.1	0.0	+0.4	+1.1	+1.3	+1.3
Pacific Sea Level Anomaly (cm)																			
YAP	(10N,138E)	8	-2	-2	2	1	6	5	-2	-3	2	9	6	8	7	9	11	1	
RABAUL	(4S,152E)	-7	-13	-18	-18	-18	-20	-18	-13	-11	-10	-6	-6	-6	-9	-10	-14	-12	
MAJURO	(7N,171E)	-14	-12	-9	-7	0	-2	4	7	7	11	15	6	4	-1	-4	-4	-8	
TARAWA	(1N,173E)	0	1	-3	-4	-7	-2	-2	2	3	5	2	2	4	1	7	10	3	
CHRISTMAS	(2N,157W)	15	18	15	15	7	5	-3	-2	-7	-4	-3	4	1	5	4	8	6	
SANTA CRUZ	(1S, 90W)	7	18	20	18	8	4	-4	-1	-1	-3	-1	-1	-2	4	8	7	7	

第１表 (a) エルニーニョ監視指数

Table 1(a) El Niño monitoring indices. Data sources are the El Niño Monitoring Center, JMA for the sea surface temperature and the SOC of ISLP-PAC, Dept. of Oceanography, University of Hawaii for the sea level anomaly.

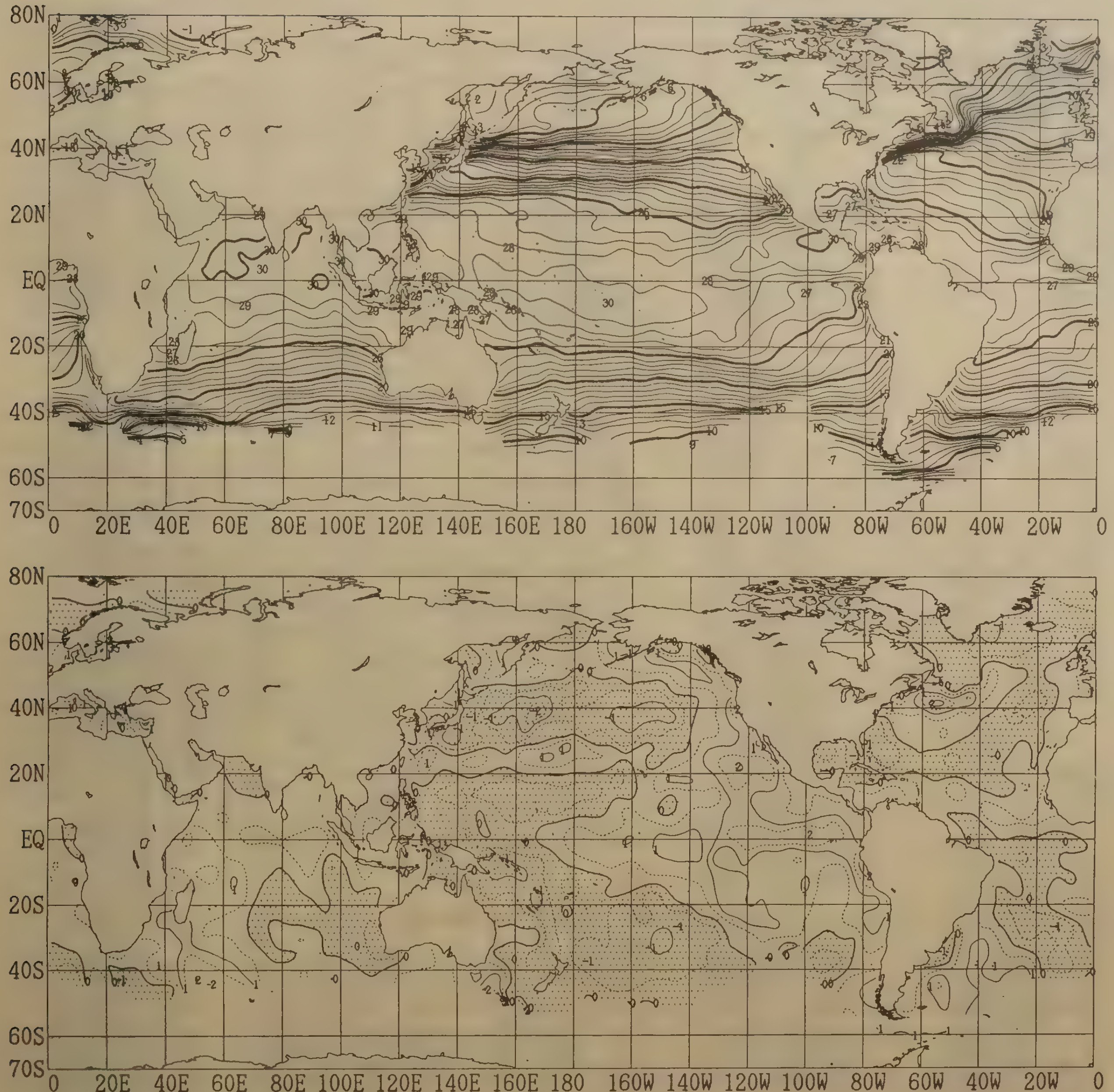
Date	1991 DEC	1992 JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	1993 JAN	FEB	MAR	APR	MAY
Southern Oscillation Index (Unit of pressure anomalies at Tahiti and Darwin : hPa)																		
S O I (TAHITI-DARWIN)	-1.8	-2.5	-0.8	-2.0	-1.6	-0.1	-1.3	-0.5	0.1	-0.0	-2.0	-0.6	-0.5	-0.8	-0.6	-0.5	-1.9	-0.8
TAHITI (17.5S , 150W)	-2.1	-1.7	-0.9	-1.5	-0.8	0.0	-1.6	0.7	0.1	-0.8	-2.3	-0.5	-1.1	-1.4	-1.9	1.0	-0.7	0.2
DARWIN (12.5S , 131E)	1.0	3.7	1.0	2.8	1.4	0.1	-0.1	1.6	-0.1	-0.8	0.5	0.6	-0.2	0.4	-0.3	2.4	1.9	1.4
High Cloud Amount Index																		
HCLD-PH (20N ~ 10N) (110E ~ 140E)	-1.9	-1.0	-1.2	-1.1	-1.0	-1.5	-1.1	-0.3	0.2	-1.6	0.9	-1.7	-1.4	-1.0	-0.3	-0.4	-0.5	-2.2
HCLD-MC (5N ~ 5S) (110E ~ 135E)	-0.7	-2.2	-1.4	-1.4	-1.0	-1.0	-0.7	-0.5	-1.2	-0.4	0.6	-0.8	0.4	-1.1	-0.9	-1.1	0.3	-1.4
HCLD-DL (5N ~ 5S) (170E ~ 170W)	1.3	1.6	1.0	1.8	2.3	2.0	1.7	0.0	0.1	-0.6	-0.1	1.3	1.2	0.8	1.4	0.5	2.8	2.0
Equatorial Zonal Wind Index																		
U200-IN (5N ~ 5S) (80E ~ 100E)	0.6	1.2	-1.3	0.5	0.1	0.6	0.2	-0.4	-0.4	-1.1	-1.4	0.1	0.1	-0.1	0.8	-0.9	-0.3	0.5
U200-CP (5N ~ 5S) (180 ~ 125W)	-0.4	0.0	-0.8	-0.8	-0.9	-1.1	-0.1	0.0	1.1	-0.4	0.7	-0.2	0.7	-0.3	-0.3	0.0	-0.6	-1.3
U850-WP (5N ~ 5S) (160E ~ 175W)	1.4	1.8	0.6	1.0	0.9	0.6	0.1	0.1	-0.4	0.2	0.2	0.4	0.8	0.3	0.9	0.3	0.8	0.5
U850-CP (5N ~ 5S) (170W ~ 135W)	1.0	1.8	0.8	1.1	0.8	0.9	0.1	0.3	-0.7	0.5	-0.4	0.9	0.2	0.2	0.0	-0.1	0.3	0.6
U850-EP (5N ~ 5S) (130W ~ 100W)	-0.3	1.6	0.0	0.3	0.2	0.5	0.4	-0.1	-0.9	0.6	-1.2	1.9	-0.0	0.1	-0.1	0.2	0.5	0.9

第１表 (b) エルニーニョ監視指数(続き)

Table 1(b) El Niño monitoring indices (continued) .

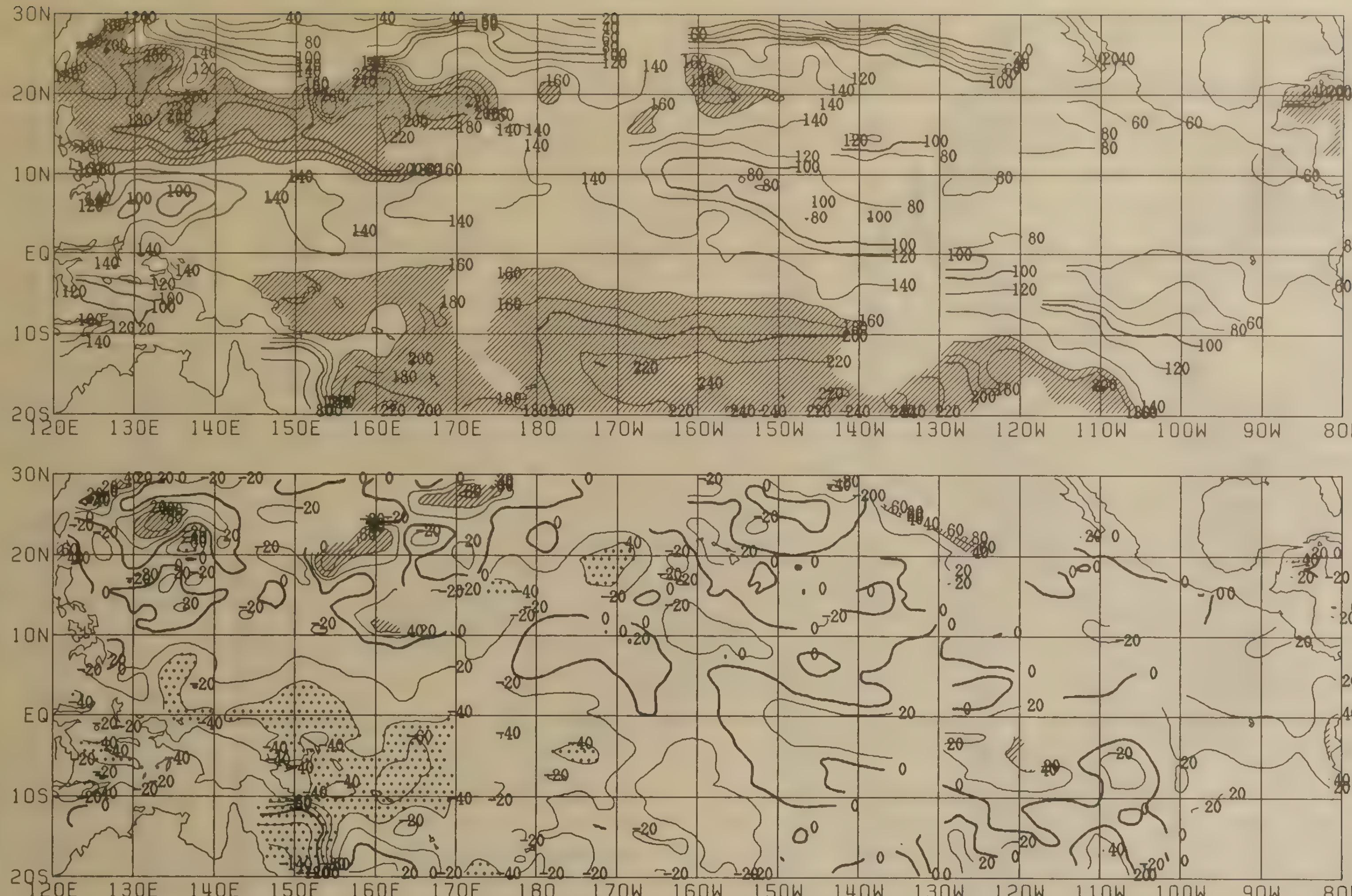
Data source for these atmospheric conditions is the Long-range Forecast Division, JMA.

SST & Anomalies in the Global Ocean

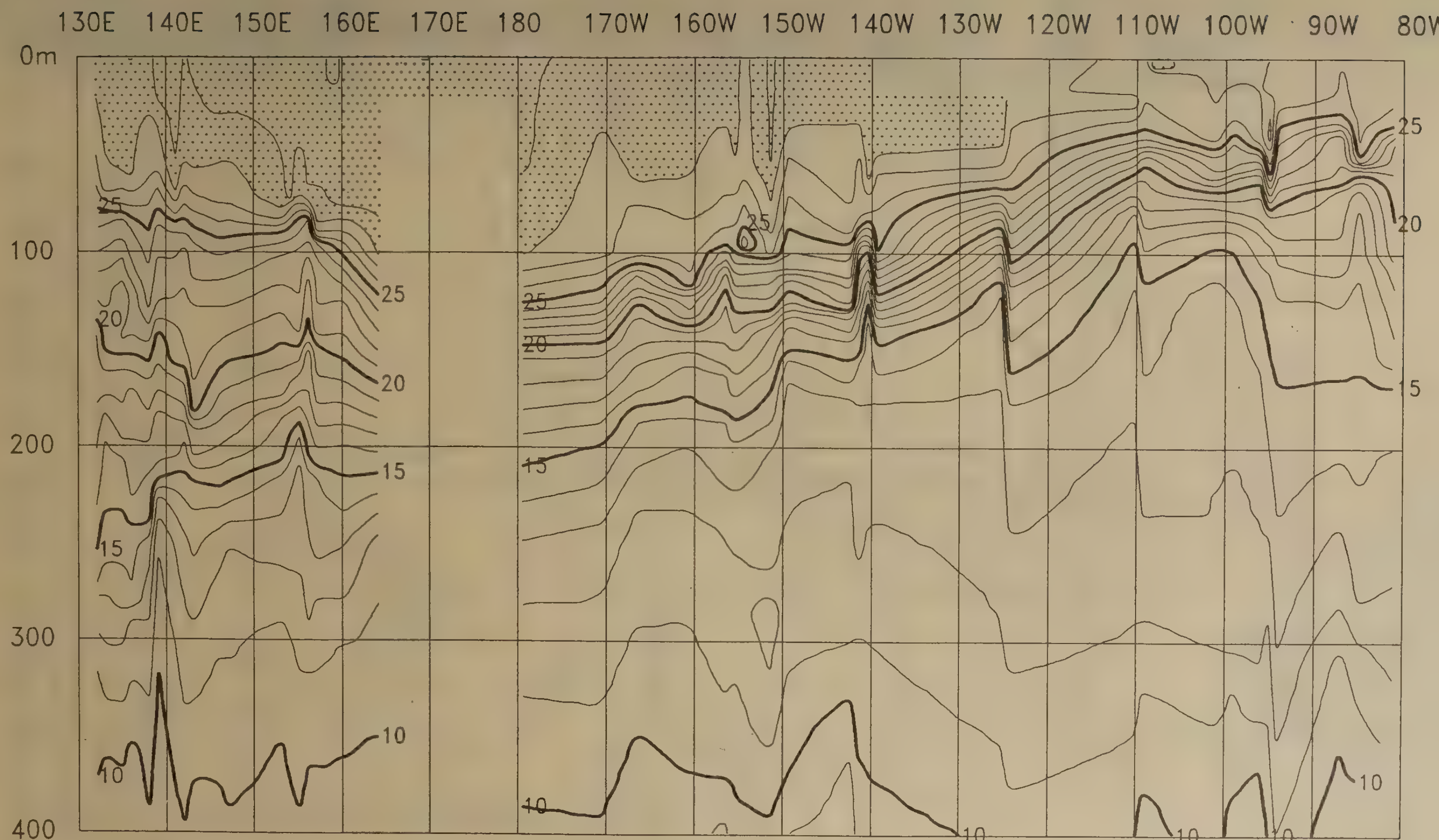


第１図　全球月平均海面水温図（上）及び偏差図（下）（1993年 5月）

Fig.1 Monthly mean sea surface temperature in the global ocean (top) and anomalies (bottom) for MAY 1993. Anomalies are computed with respect to the JMA climatology (1961−90) (Climatic charts of sea surface temperatures of the western North Pacific and the global ocean, March 1991). The Contour interval is 1° C and additional anomaly contours of ±0.5° C are shown as broken lines. Negative anomalies are stippled.

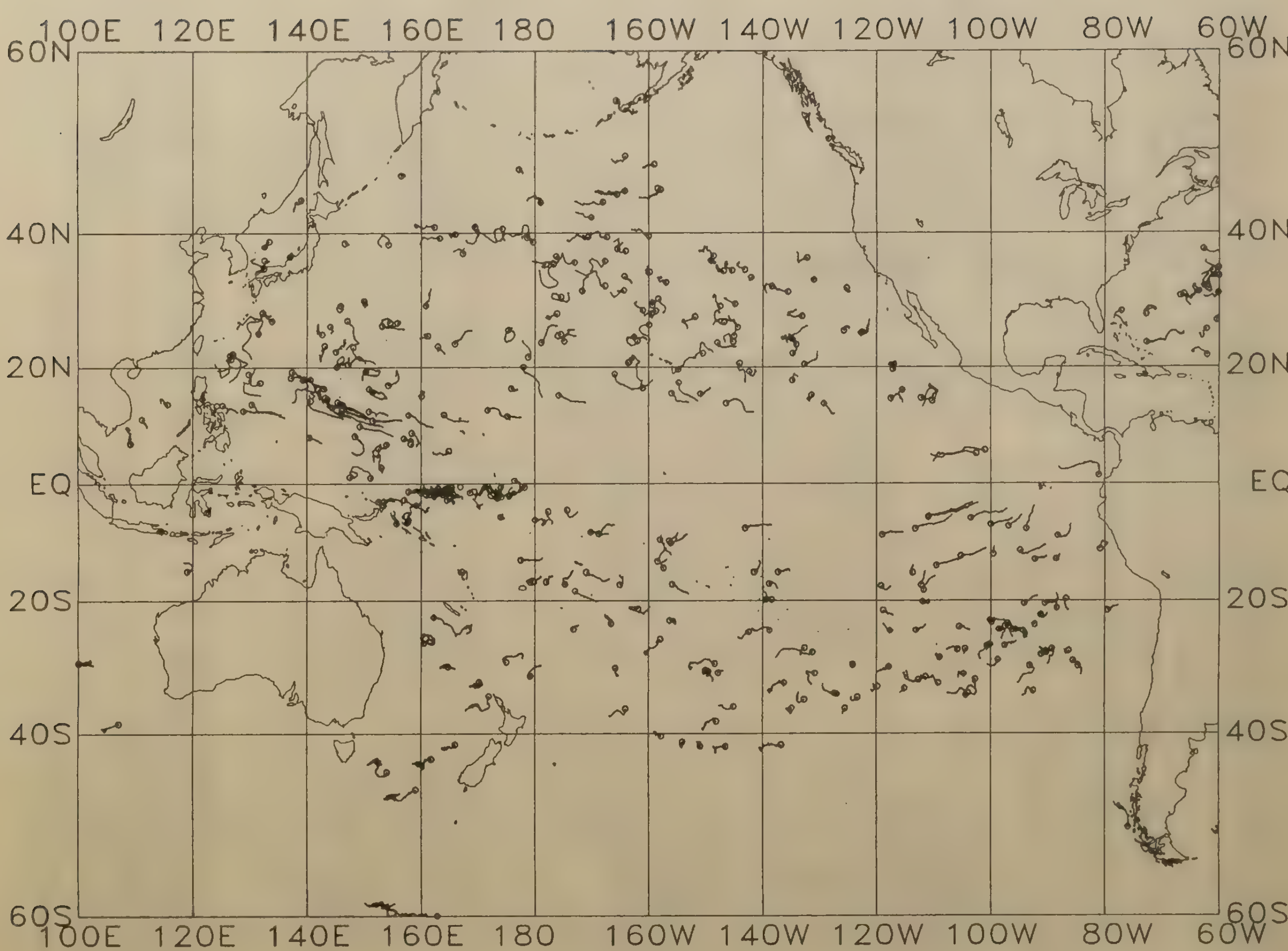


第２図　太平洋表層水温（20℃深度）図（上）及び偏差図（下）（1993年 5月）
Fig.2 The depth of a 20° C isotherm in the Pacific Ocean (top) and anomalies (bottom) for MAY 1993. Anomalies are computed with respect to the climatology (Levitus, 1982, Climatological Atlas of the World Ocean, NOAA).
The contour interval is 20m with shading for values greater than 160m (top), and shading/stippling for values greater/smaller than +40m/−40m (bottom).



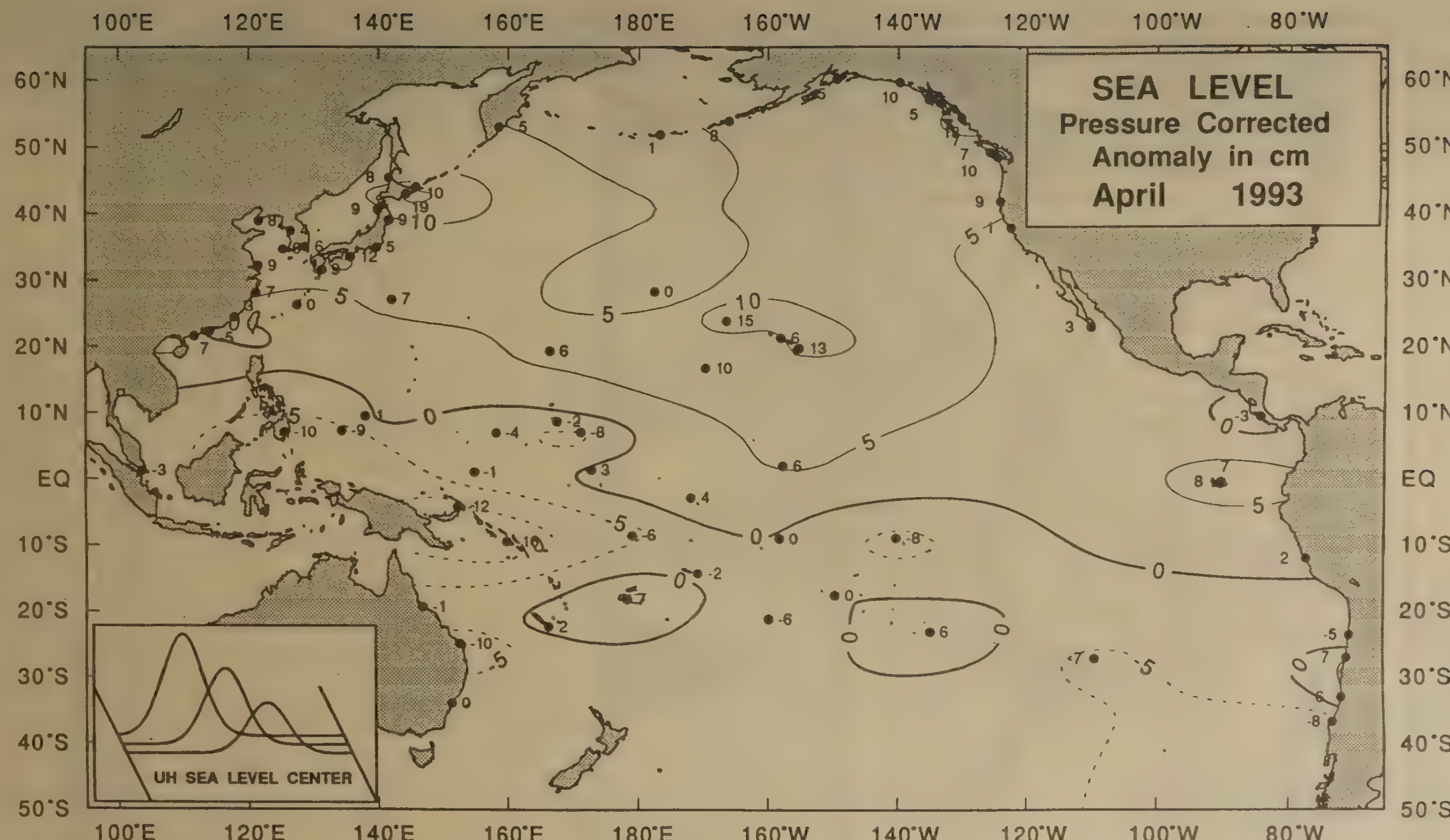
第３図　太平洋赤道に沿う表層水温断面図（1993年 5月）

Fig.3 Depth-longitude section of the Pacific Ocean temperature along the equator for MAY 1993. The contour interval is 1° C with spotted shading for values greater than 28° C.



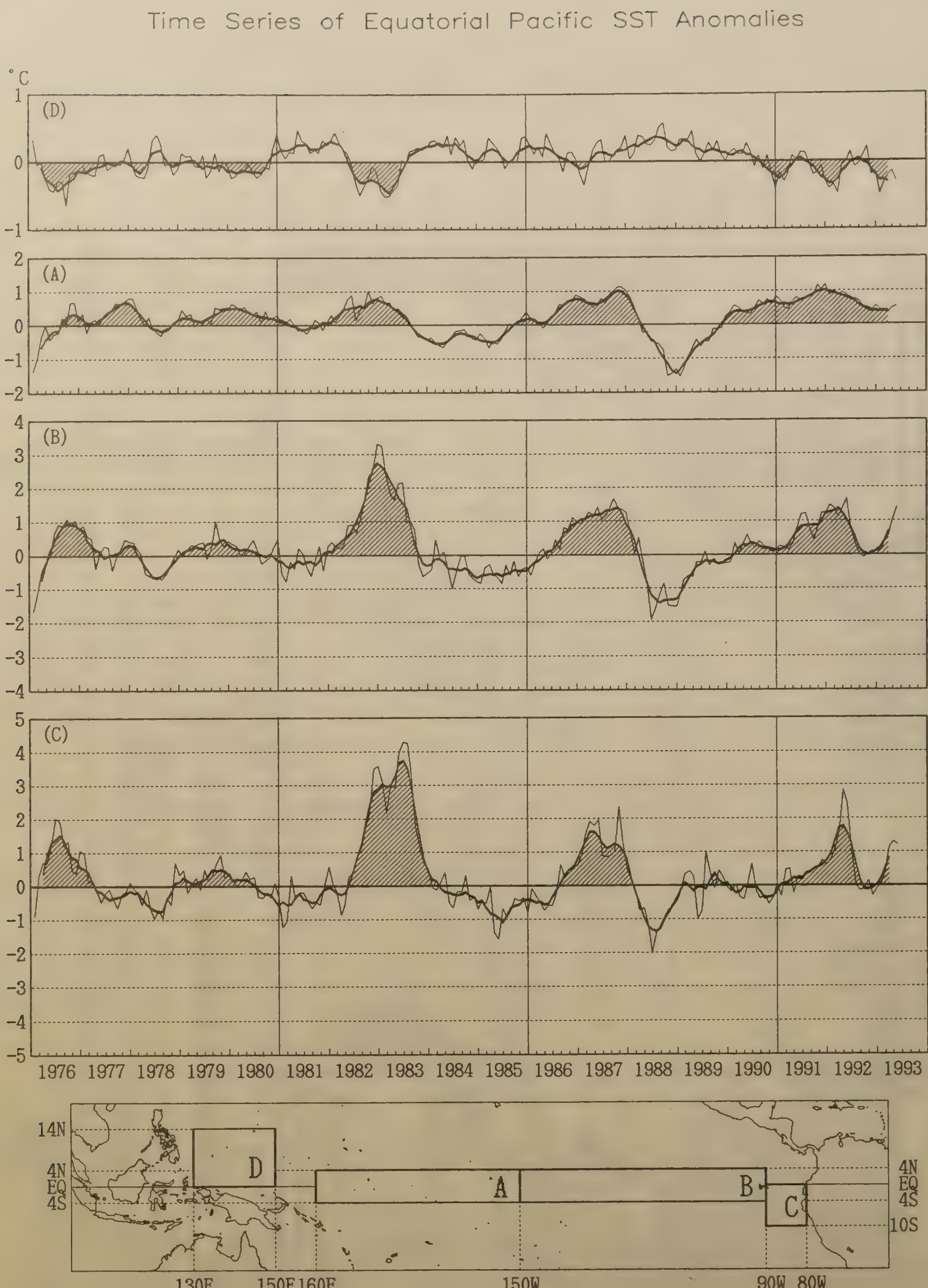
第4図　太平洋ブイ流跡図(1993年 5月)

Fig.4　Movements of drifting buoys in the Pacific Ocean during MAY 1993.　Each track is one buoy, with the small circle representing the buoy's last position for the month.



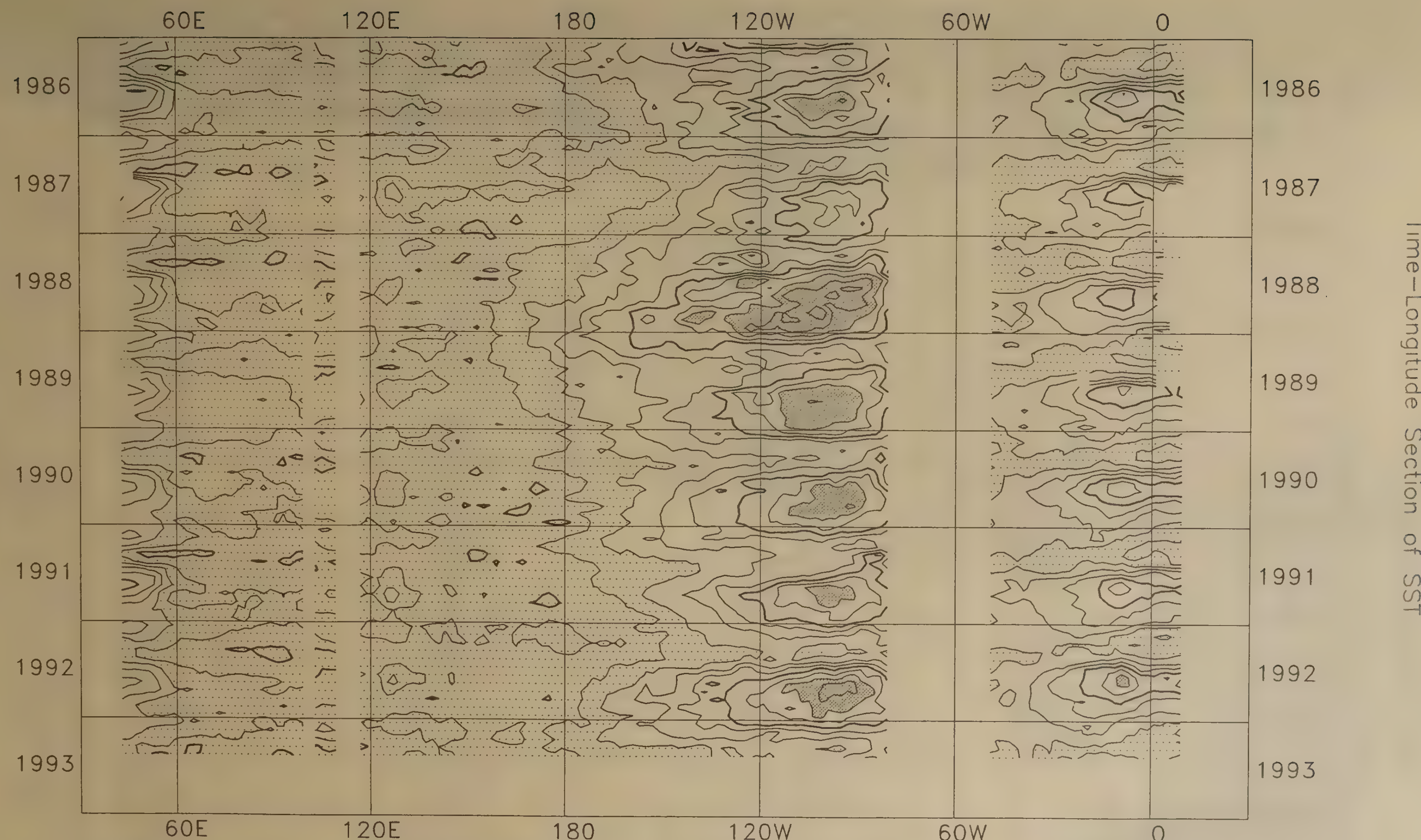
第5図　太平洋海面水位偏差図（ 1993年 4月 ）

Fig.5 Sea level anomalies obtained from the 1975 to 1986 mean APR sea level adjusted for atmospheric pressure (APR 1993).
This figure is prepared by the SOC of ISLP–PAC, Dept. of Oceanography, Univ. of Hawaii.



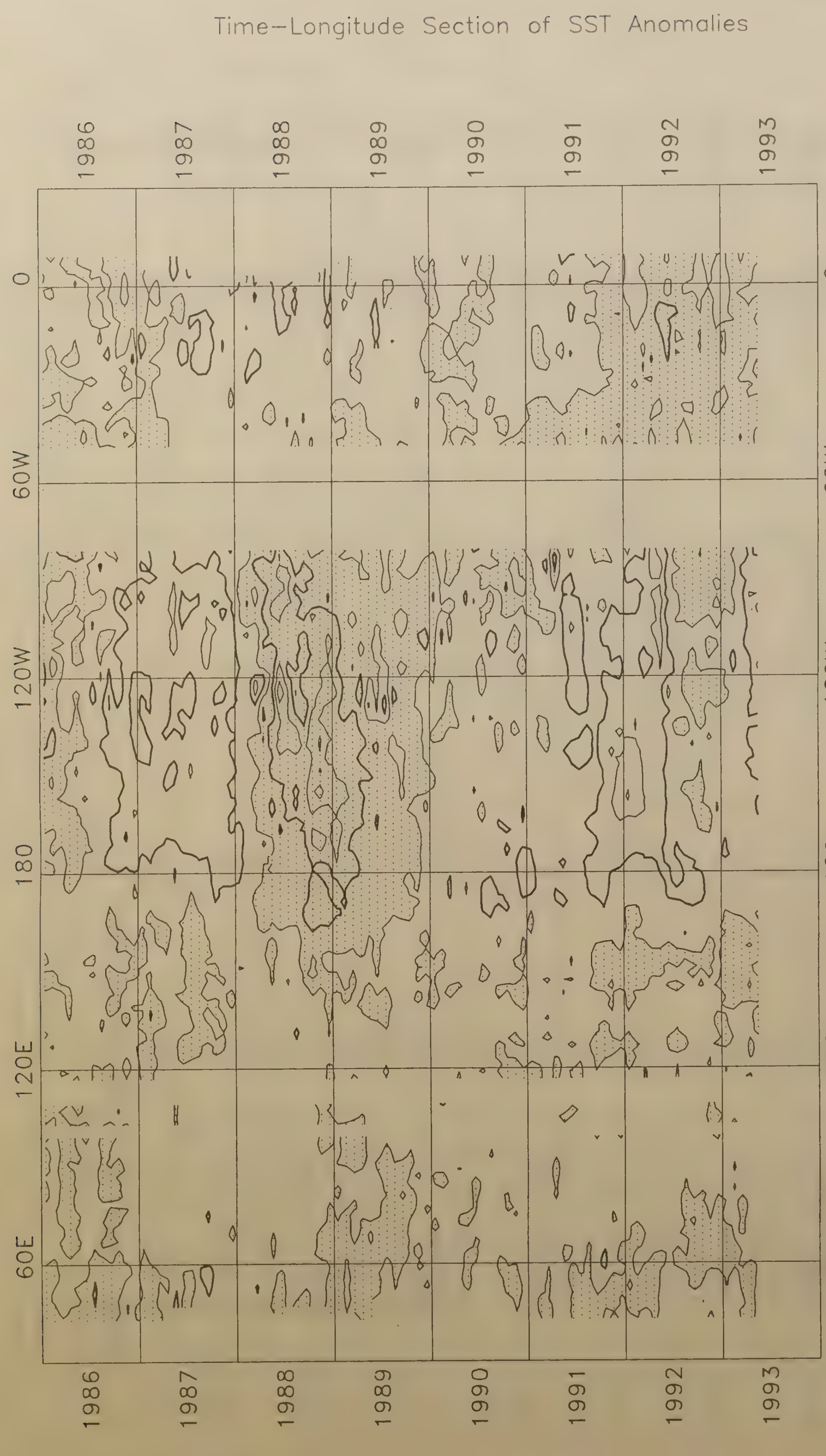
第６図　赤道太平洋海面水温偏差時系列図

Fig.6 Time series of monthly mean SST anomalies in the equotorial Pacific Ocean for the areas indicated at the bottom of the figure. Thin lines show the monthly values and thick lines their 5 month running mean. Positve anomalies (A,B,C) and negative anomalies (D) are shaded. Anomalies are computed with respect to the JMA climatology (1961–90).



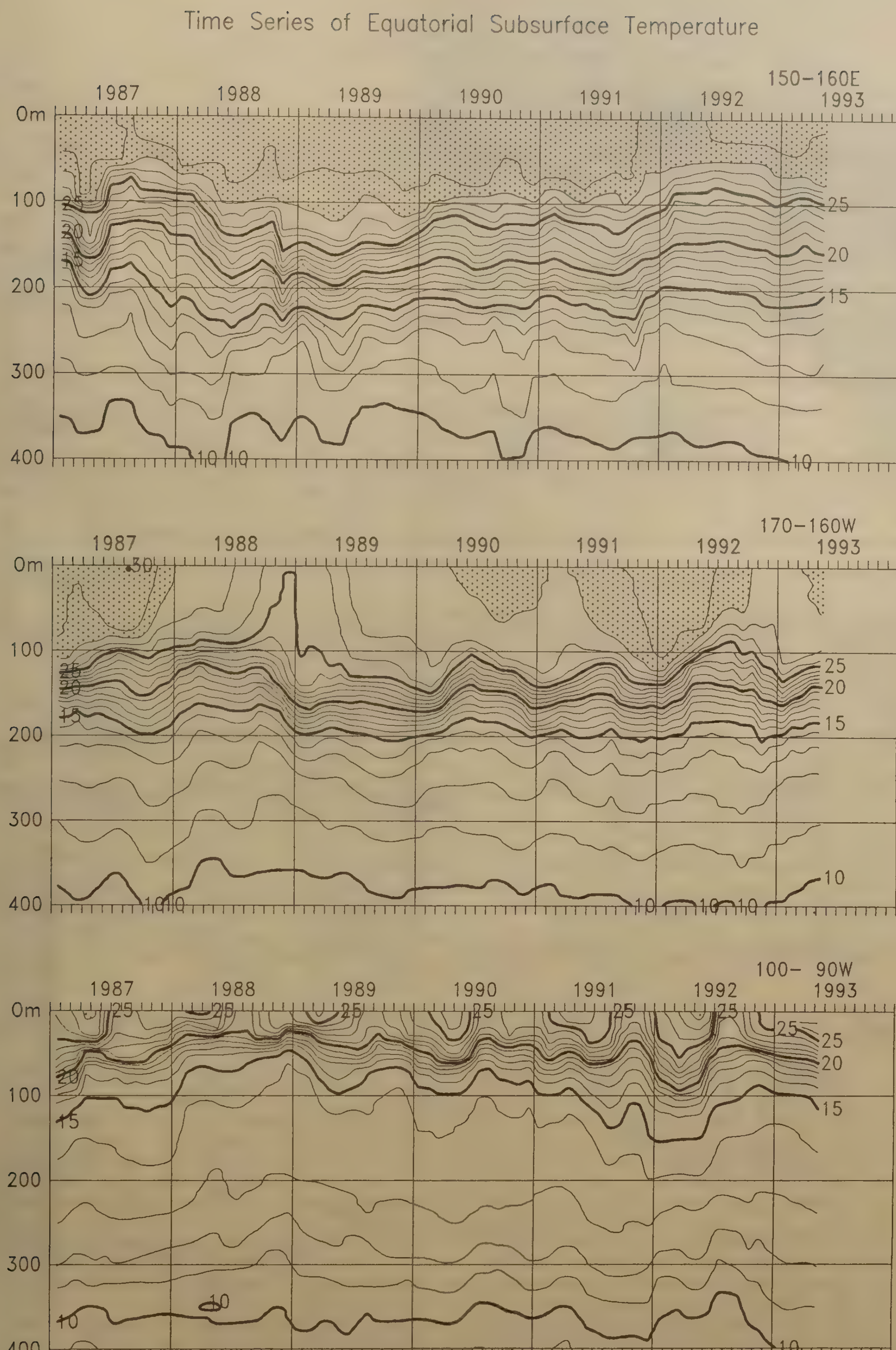
第7図　赤道に沿う海面水温時系列図

Fig.7 Time–longitude section of SSTs along the equator (2° N–2° S) in the global ocean. The contour interval is 1° C, with thick contour lines at 25 and 30° C. SST values greater than 28° C are spotted and values less than 23° C are shaded.



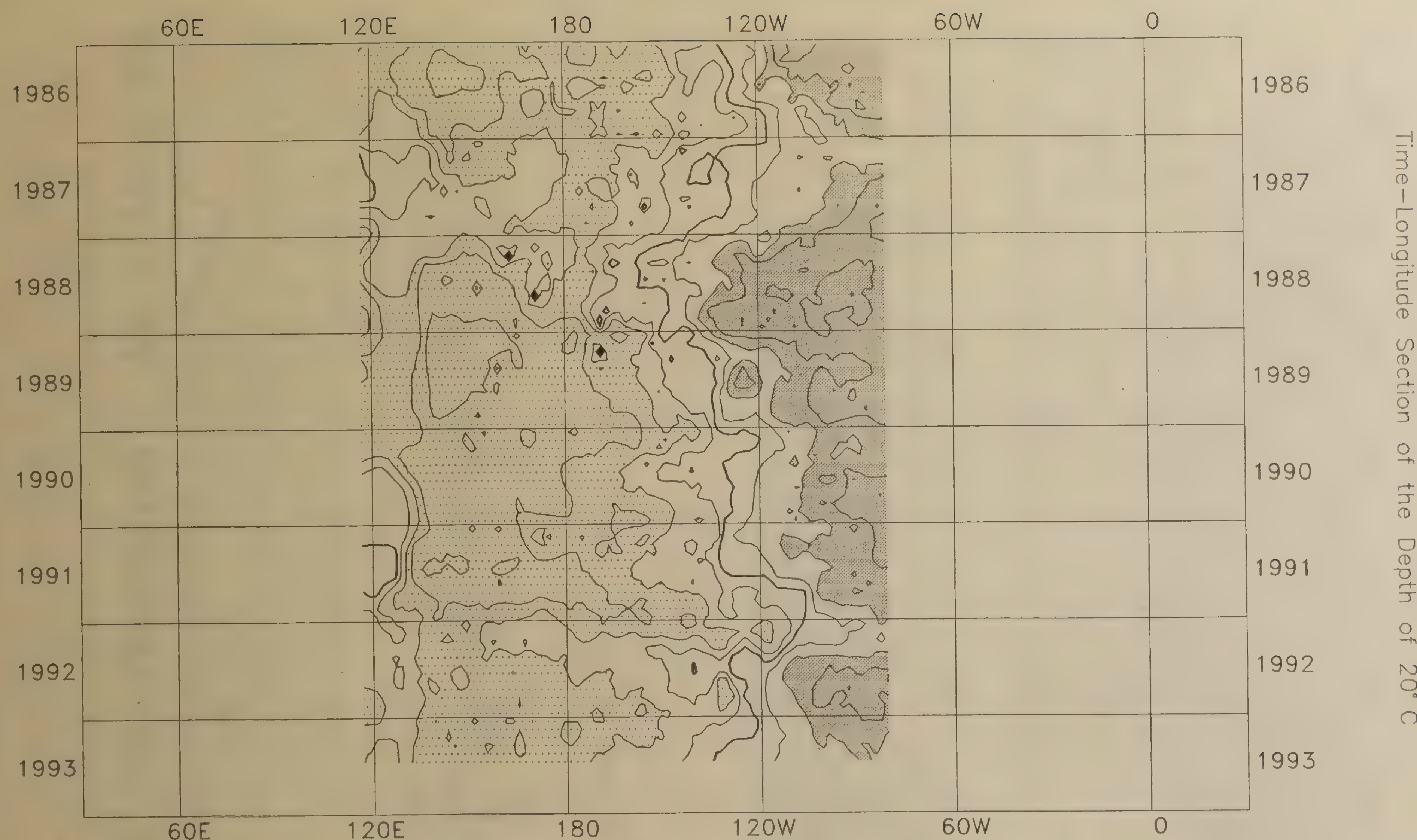
第8図　赤道に沿う海面水温偏差時系列図

Fig.8 Time-longitude section of SST anomalies along the equator (2° N–2° S) based on the JMA climatology (1961–1990). The contour interval is 1° C, with thick contour lines at +1° C and −1° C. Negative anomalies are spotted.



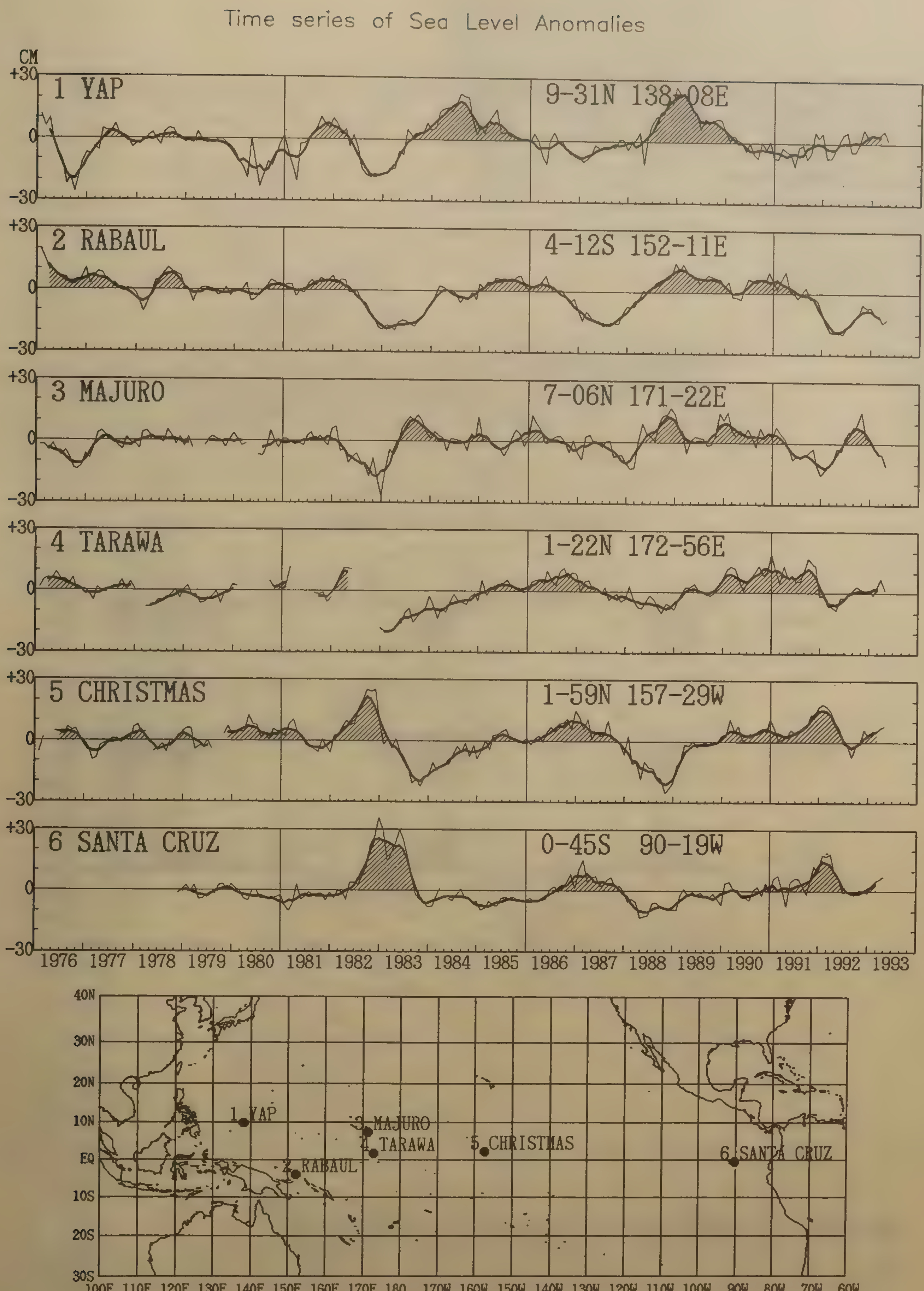
第９図　赤道太平洋表層水温時系列図（上：西部、中：中部、下：東部）

Fig.9 Time series of equatorial (2° N–2° S) subsurface temperature for the western Pacific (top, 150–160° E), the central Pacific (middle, 170–160° W) and the eastern Pacific (bottom, 100–90° W). The contour interval is 1° C with spotted shading for the values greater than 28° C.



第10図　太平洋の赤道に沿う20℃深度時系列図

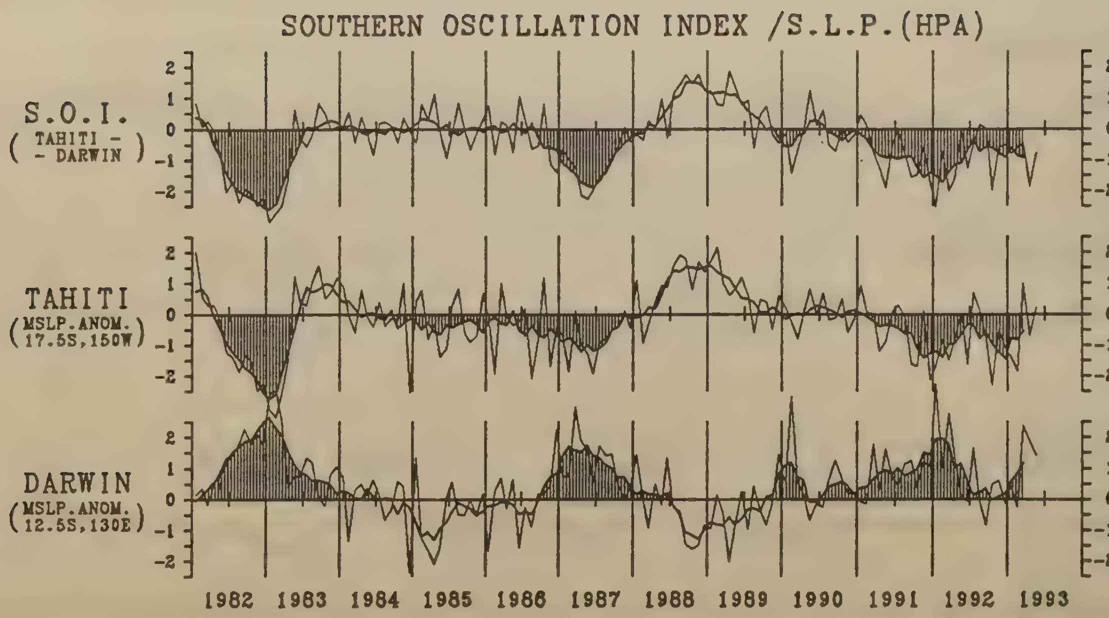
Fig.10 Time-longitude section of the depth of a 20° C isotherm along the equator in the Pacific Ocean. The contour interval is 20m with thick contour lines at 100m. Values shallower than 60m are shaded and those deeper than 140m are stippled.



第11図　太平洋月平均海面水位偏差時系列図

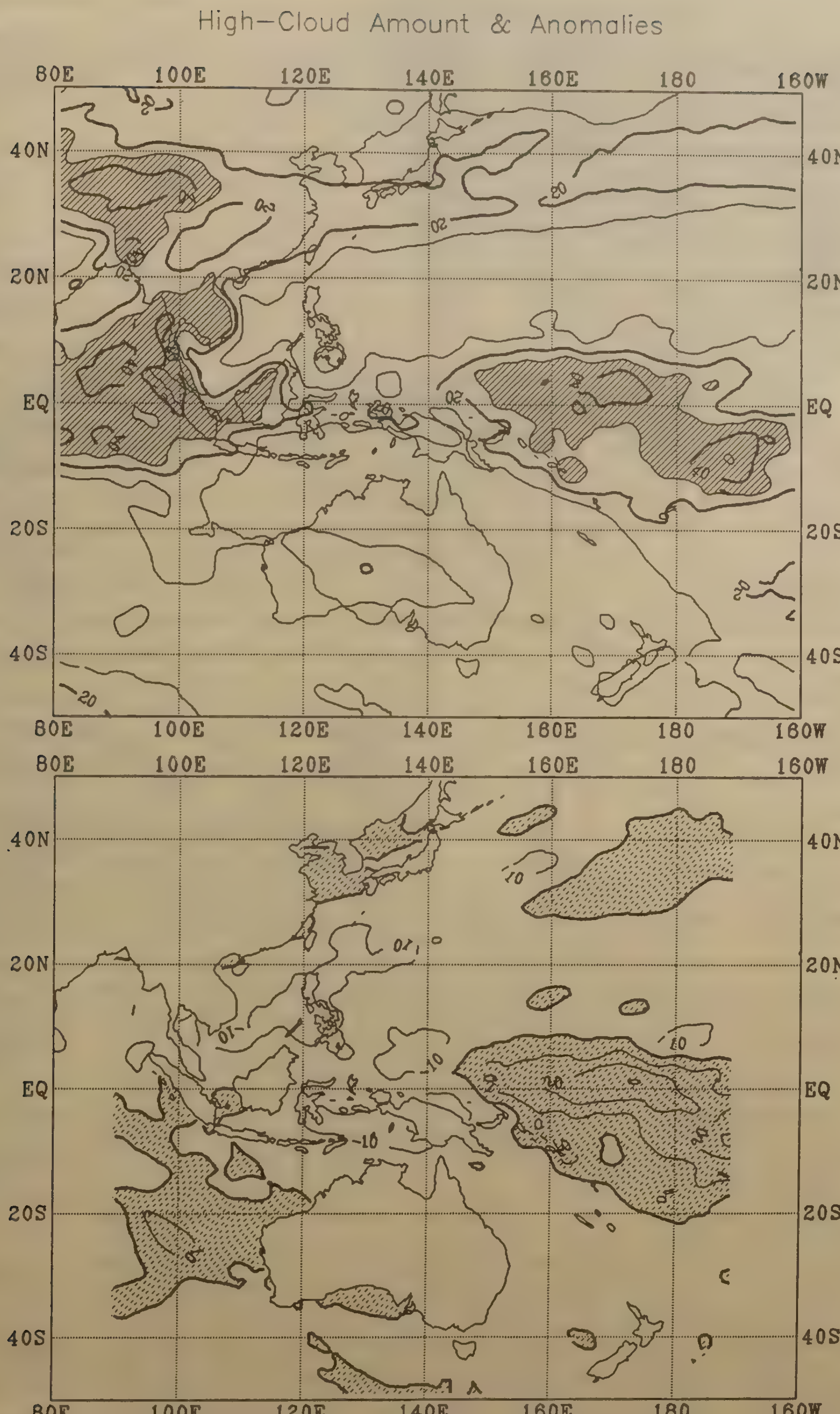
Fig.11 Time series of sea level anomalies based on 1976 to 1990 monthly mean sea level obtained from the stations indicated at the bottom of the figure. Thin lines show the monthly mean and thick lines show their 5 month running mean. Positive anomalies are shaded.

Time series of SOI & Sea Level Pressure Standardized Anomalies



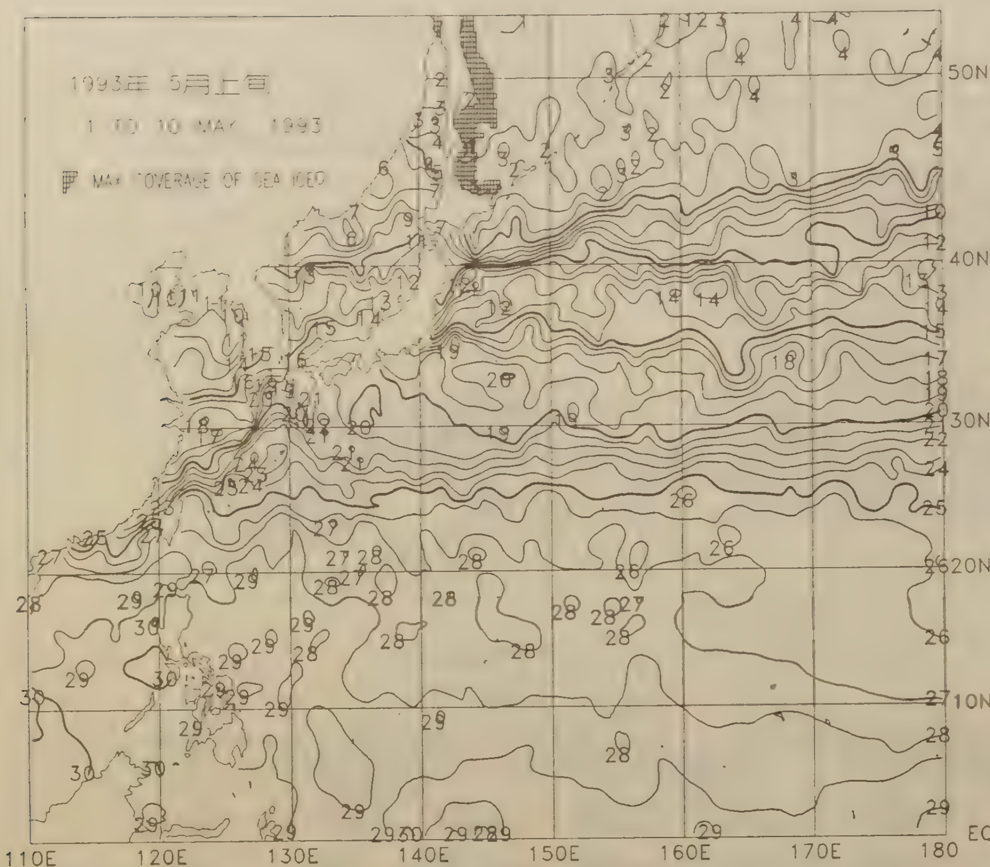
第12図　南方振動指数及び海面気圧偏差時系列図

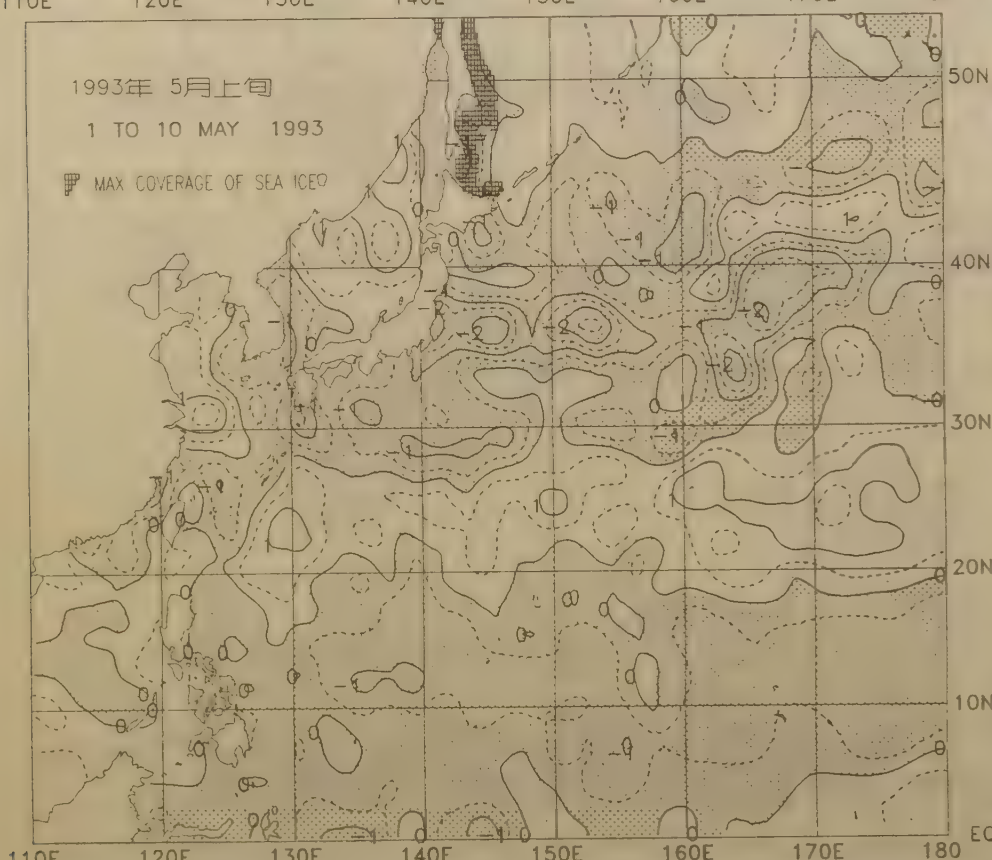
Fig.12 The Southern Oscillation Index (top) and monthly mean sea level pressure standardized anomalies at Tahiti (middle) and Darwin (bottom). Thin lines show the monthly mean and thick lines their 5 month running mean. Negative values (top, middle) and positive values (bottom) are shaded. Base periods for normals and standard deviations are 1961−1990. This figure is prepared by the Long−range Forecast Division, JMA.



第13図　月平均上層雲量分布図及び偏差図（1993年 5月）

Fig.13 Monthly mean of the high-cloud amount (%, top) and its anomalies (%, bottom) in the equatorial Pacific for MAY 1993. The contour interval is 10%. Areas above 30% are shaded (top) and positive anomalies are stippled (bottom). Anomalies represent a departure from the 1978–1990 base period monthly means. This figure is prepared by the Long-range Forecast Division, JMA.





旬平均沿岸水温(℃)
Coastal Water Temperature

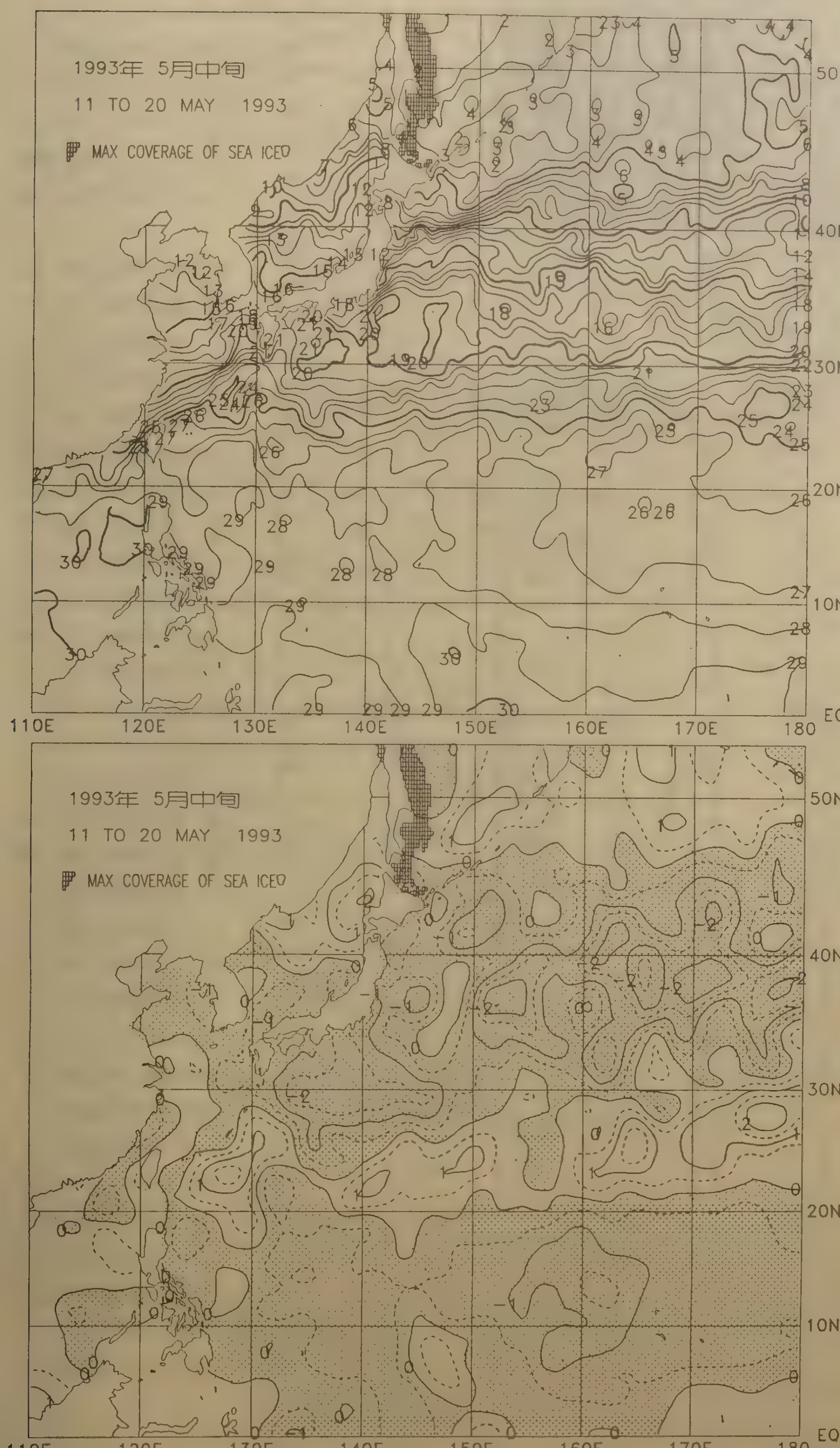
地名 (Index Number)	水温 Temp.	偏差 Anom.
石垣島(47918)	25.9	+0.3
那　覇(47936)	24.4	+1.0
名　瀬(47909)	-	-
足摺岬(47898)	18.5	−0.7
潮　岬(47778)	18.9	-
御前崎(47655)	16.4	−1.1
八丈島(47678)	18.1	−1.7
館　山(47672)	17.0	+0.1
小名浜(47598)	10.5	−1.5
宮　古(47585)	9.8	+1.6
浦　河(47426)	4.4	−0.2
紋　別(47435)	3.7	-
稚　内(47401)	7.6	-
寿　都(47421)	9.9	-
江　差(47428)	-	-
飛　島(47587)	-	-
輪　島(47600)	-	-
西　郷(47740)	15.0	-
浜　田(47755)	16.4	-
厳　原(47800)	16.1	-
牛　深(47838)	17.9	-

海洋気象ブイロボット
旬平均海面水温(℃)
Ocean Data Buoy SST

日本海	37.9N,145.4E	11.6
四国沖	29.0N,135.0E	20.6
東シナ海	28.2N,126.3E	23.5

第14図 北西太平洋旬平均海面水温図(上)及び偏差図(下)(1993年 5月上旬)

Fig.14 Ten-day mean SSTs in the western North Pacific (top) and anomalies (bottom) for the 1st ten-day period in MAY 1993. Anomalies are computed with respect to the JMA climatology (1961–90). The contour interval is 1°C and additional anomaly contours of 0.5°C are shown. Negative anomalies are stippled.



旬平均沿岸水温(℃)
Coastal Water Temperature

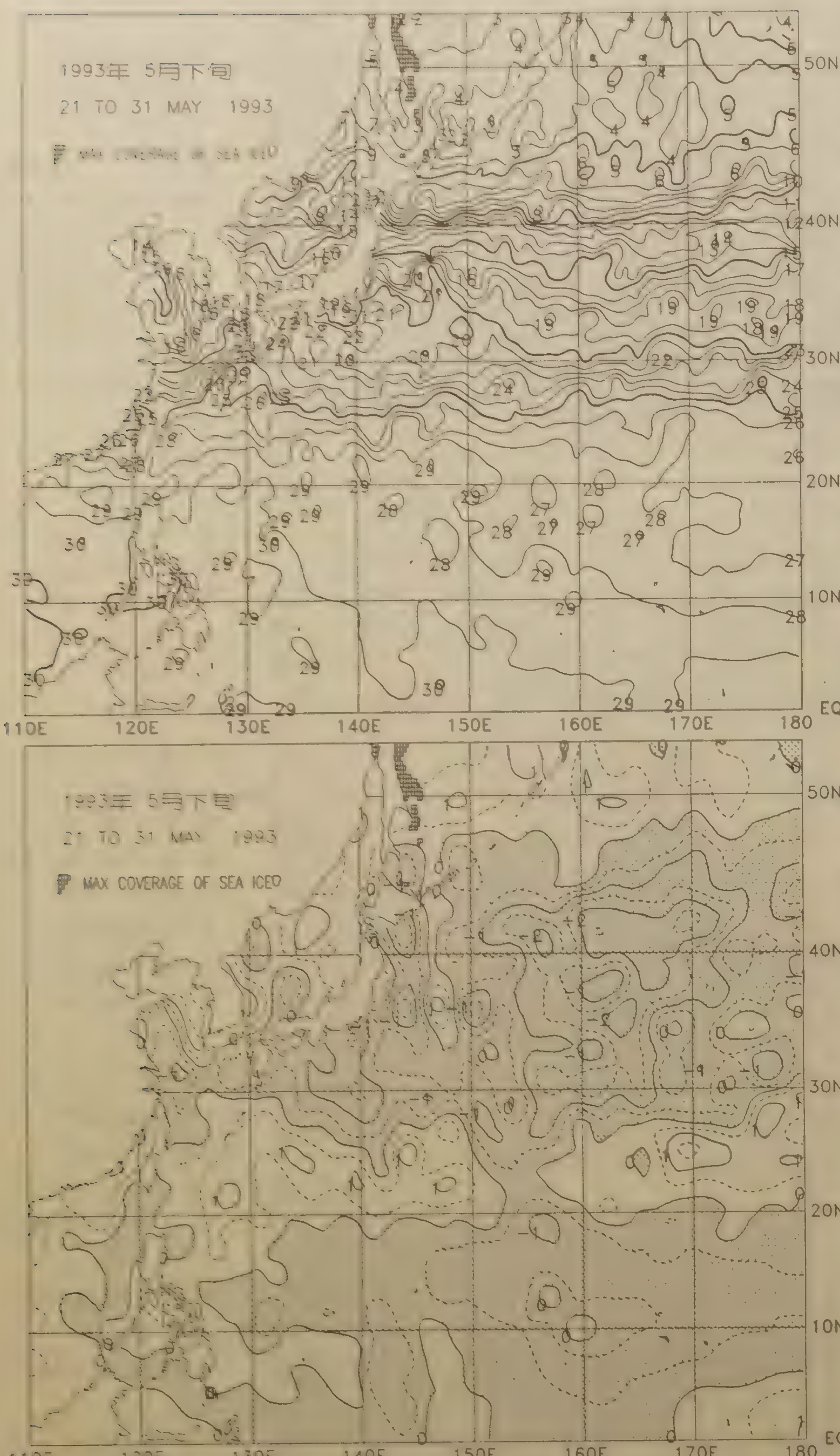
地名 (Index Number)	水温 Temp.	偏差 Anom.
石垣島(47918)	26.6	+0.4
那　覇(47936)	24.9	+1.0
名　瀬(47909)	23.1	-
足摺岬(47898)	19.4	-0.7
潮　岬(47778)	19.2	-
御前崎(47655)	18.4	-0.2
八丈島(47678)	18.2	-2.5
館　山(47672)	17.0	-0.9
小名浜(47598)	12.0	-0.9
宮　古(47585)	10.9	+1.8
浦　河(47426)	5.2	0.0
紋　別(47435)	7.2	-
稚　内(47401)	-	-
寿　都(47421)	11.6	-
江　差(47428)	11.2	-
飛　島(47587)	13.6	-0.1
輪　島(47600)	15.4	-1.0
西　郷(47740)	15.9	-
浜　田(47755)	17.2	-
厳　原(47800)	16.8	-
牛　深(47838)	18.4	-

海洋気象ブイロボット
旬平均海面水温(℃)
Ocean Data Buoy SST

日本海	37.9N,145.4E	12.8
四国沖	29.0N,135.0E	21.1
東シナ海	28.2N,126.3E	24.0

第15図 北西太平洋旬平均海面水温図(上)及び偏差図(下)(1993年 5月中旬)

Fig.15 Ten-day mean SSTs in the western North Pacific (top) and anomalies (bottom) for the 2nd ten-day period in MAY 1993. Anomalies are computed with respect to the JMA climatology (1961–90). The contour interval is 1°C and additional anomaly contours of 0.5°C are shown. Negative anomalies are stippled.



旬平均沿岸水温(℃)
Coastal Water Temperature

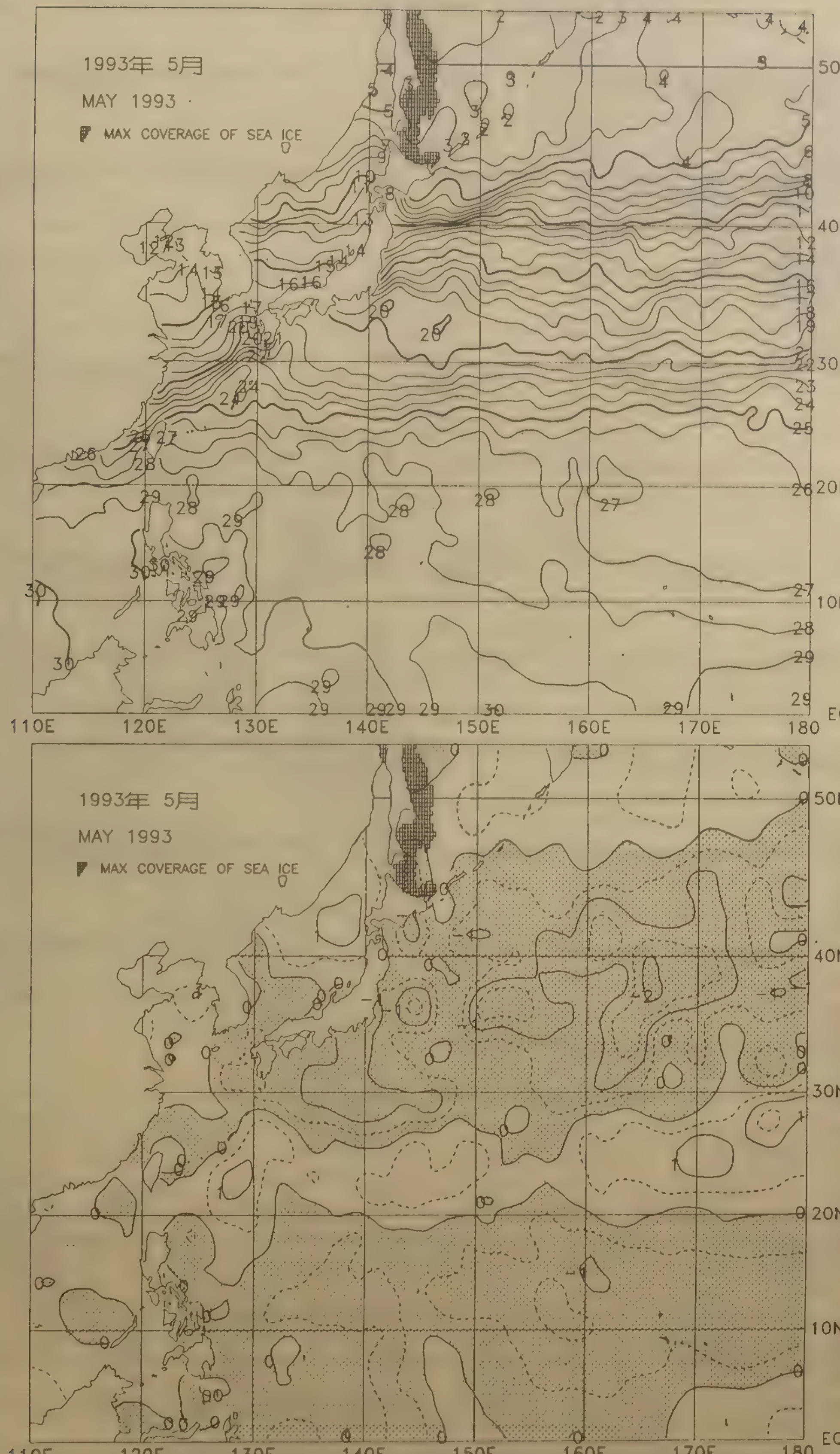
地名 (Index Number)	水温 Temp.	偏差 Anom.
石垣島(47918)	26.6	+0.1
那　覇(47936)	25.7	+1.4
名　瀬(47909)	24.4	-
足摺岬(47898)	20.1	-0.9
潮　岬(47778)	20.3	-
御前崎(47655)	19.0	-0.6
八丈島(47678)	18.2	-2.9
館　山(47672)	18.2	-0.7
小名浜(47598)	13.3	-0.1
宮　古(47585)	11.3	+1.1
浦　河(47426)	5.9	-0.8
紋　別(47435)	10.1	-
稚　内(47401)	10.5	-
寿　都(47421)	11.9	-
江　差(47428)	12.5	-
飛　島(47587)	15.4	+0.4
輪　島(47600)	18.0	+0.3
西　郷(47740)	16.1	-
浜　田(47755)	19.1	-
厳　原(47800)	17.9	-
牛　深(47838)	19.9	-

海洋気象ブイロボット
旬平均海面水温(℃)
Ocean Data Buoy SST

日本海	37.9N,145.4E	14.8
四国沖	29.0N,135.0E	22.2
東シナ海	28.2N,126.3E	24.0

第16図 北西太平洋旬平均海面水温図(上)及び偏差図(下)(1993年 5月下旬)

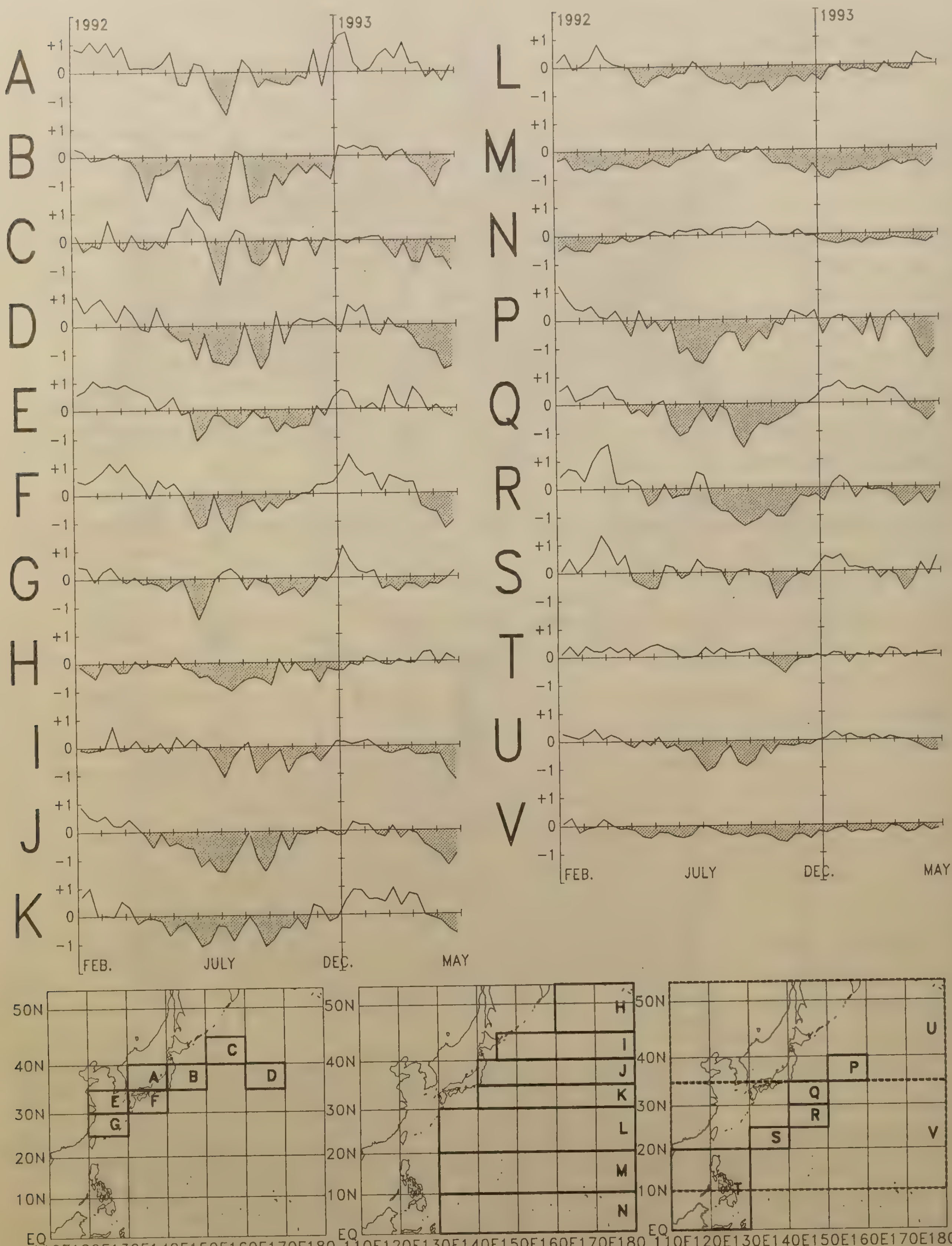
Fig.16 Ten-day mean SSTs in the western North Pacific (top) and anomalies (bottom) for the 3rd ten-day period in MAY 1993. Anomalies are computed with respect to the JMA climatology (1961-90). The contour interval is 1° C and additional anomaly contours of 0.5° C are shown. Negative anomalies are stippled.



第17図 北西太平洋月平均海面水温図(上)及び偏差図(下)(1993年 5月)

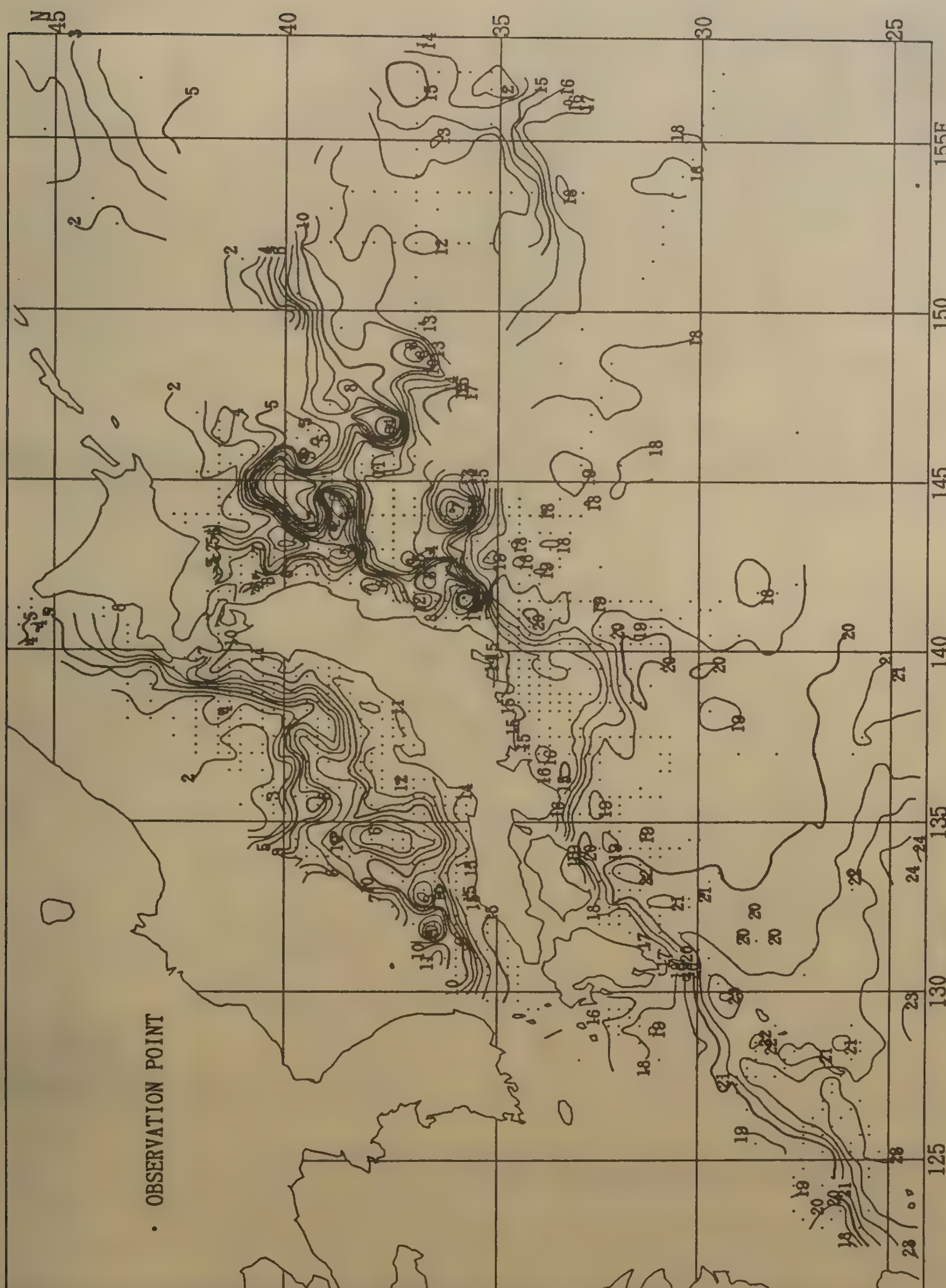
Fig.17 Monthly mean SSTs in the western North Pacific (top) and anomalies (bottom) for MAY 1993. Anomalies are computed with respect to the JMA climatology (1961–90). The contour interval is 1° C and additional anomaly contours of 0.5° C are shown. Negative anomalies are stippled.

Time Series of Area Mean SST in the Western North Pacific



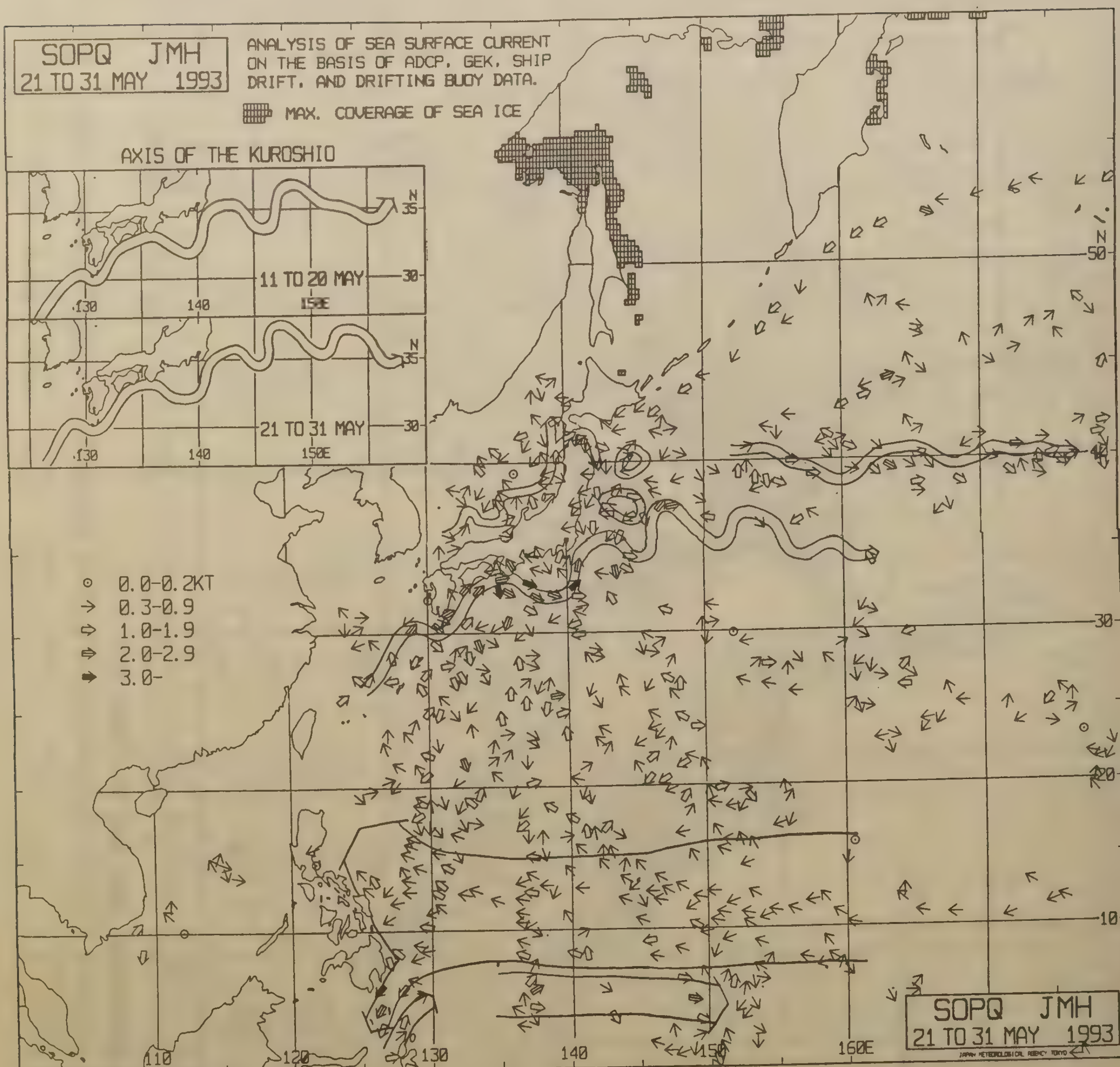
第18図　北西太平洋旬平均海面水温平年偏差時系列図

Fig.18 Time series of the ten-day mean sea surface temperature anomalies (°C) in the western North Pacific for the areas indicated at the bottom. Negative anomalies are shaded. Anomalies are computed with respect to the JMA climatology (1961–90).



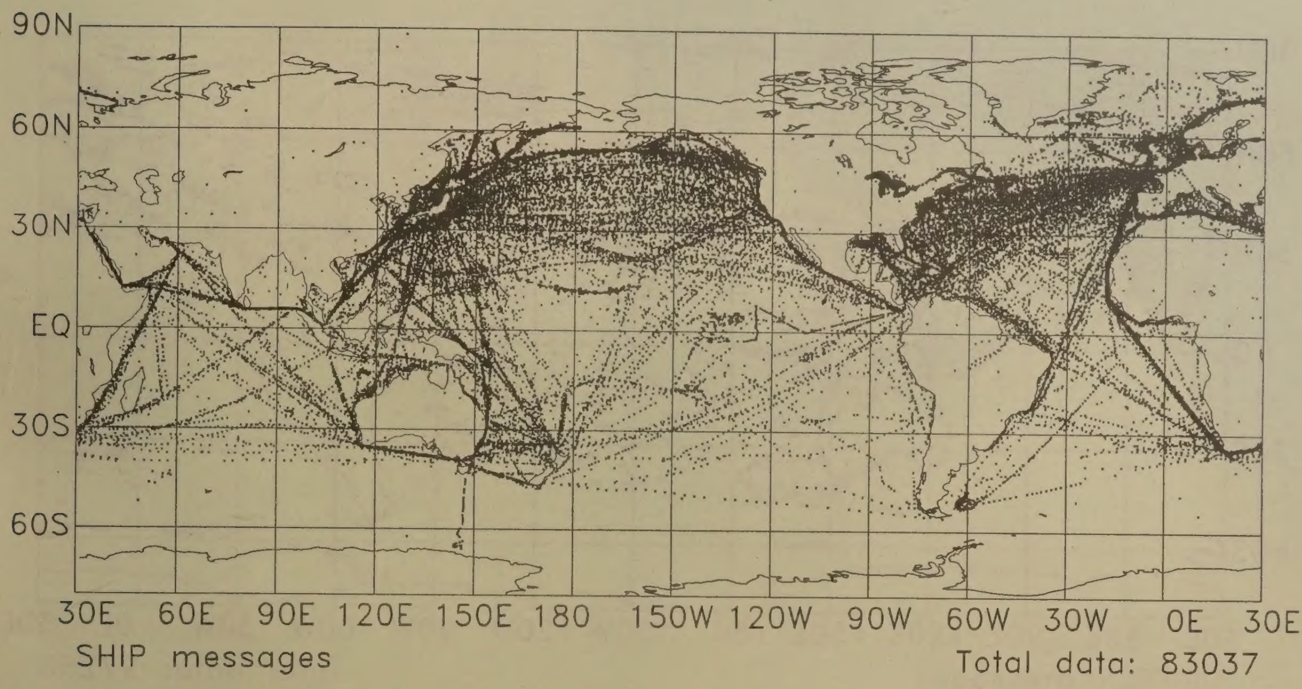
第19図　日本近海表層水温（深さ100M）図（1993年 5月）

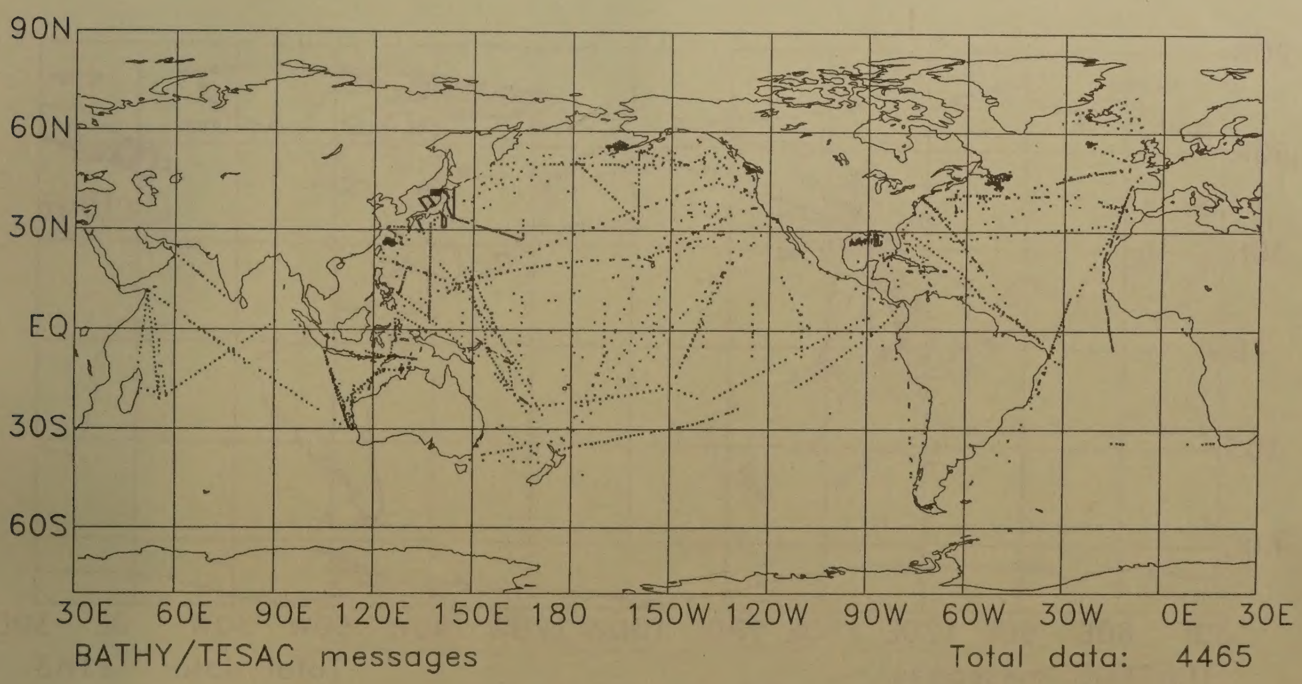
Fig.19　Subsurface (100m) temperatures in seas adjacent to Japan for MAY 1993.



第20図　北西太平洋旬平均海流図（1993年 5月下旬）

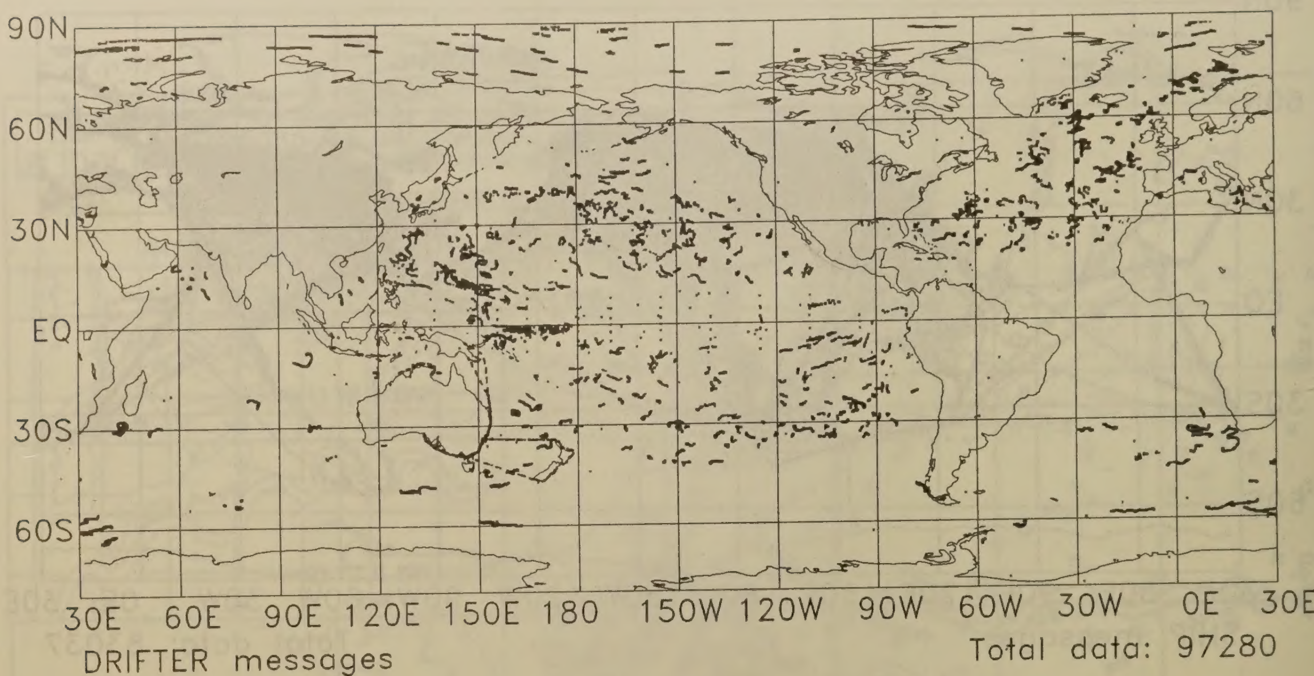
Fig.20 Ten-day analysis of the sea surface current in the western North Pacific for the 3rd ten-day period in MAY 1993. Small arrows indicate sea surface currents measured with acoustic Doppler current profilers, GEKs deployed in research vessels, and ship drift by merchant ships/drifting buoys during the month. Major currents such as the Kuroshio and the North Equatorial Current are denoted by larger open arrows.

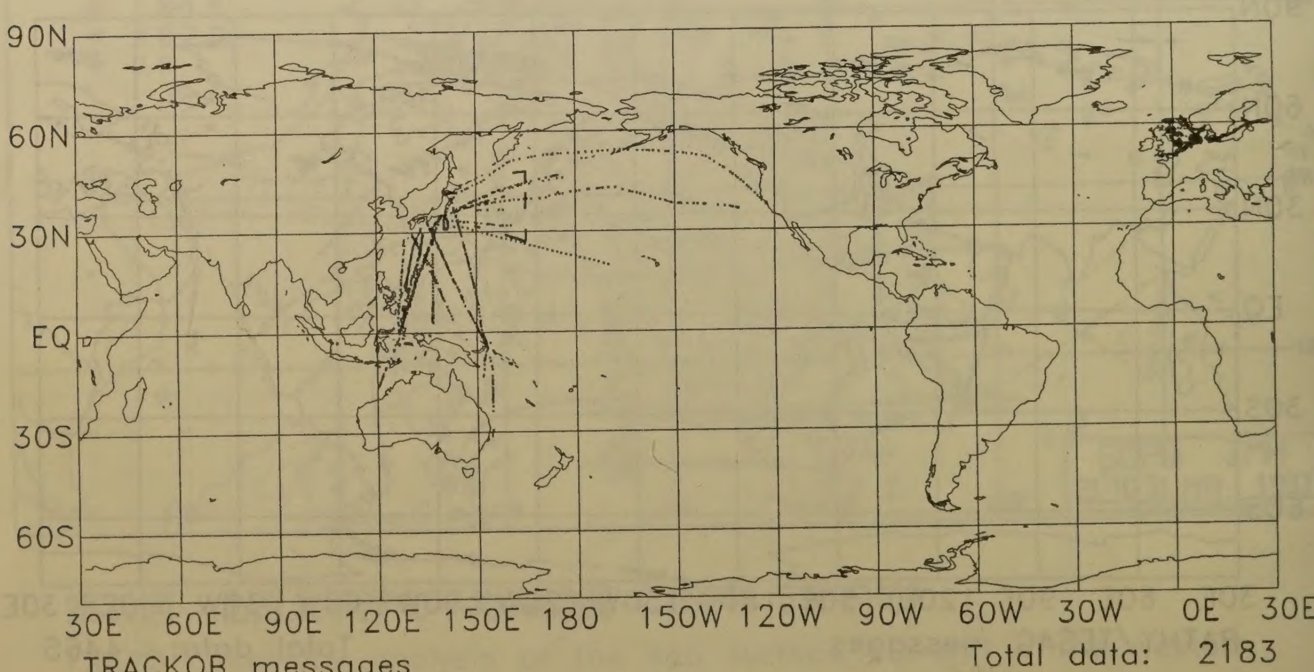




第21-1図 測点分布図(1993年 5月)

Fig.21-1 Geographical distribution of SHIP messages (SST data, top) and BATHY/TESAC messages (subsurface temperature data, bottom) for MAY 1993.





第21-2図　測点分布図(1993年 5月)

Fig.21-2　Geographical distribution of DRIFTER messages (buoy drift and SST data, top) and TRACKOB messages (ship drift and SST data, bottom) for MAY 1993.

気　象　庁　海　洋　月　報

Monthly Ocean Report

May 1993 (No.5)

平成５年６月１７日発行

編集兼発行所　気　象　庁
東京都千代田区大手町 1-3-4

印刷所　株式会社東京プリント
東京都港区西新橋 3-24-9